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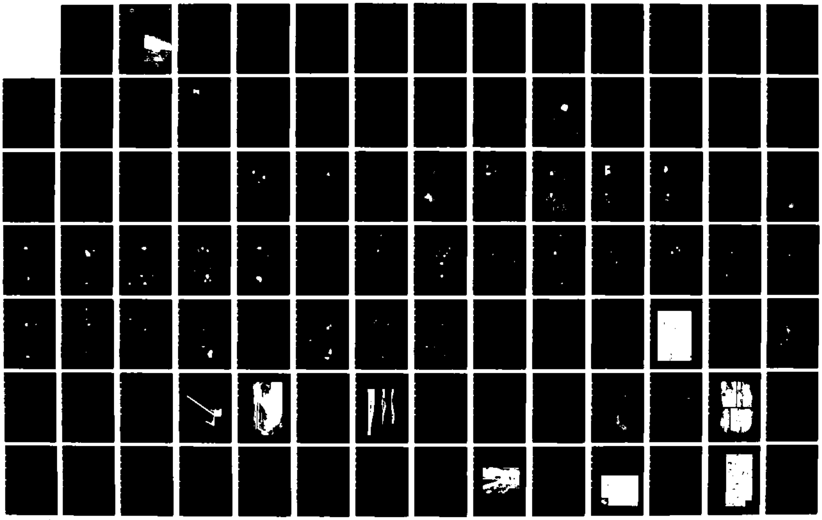

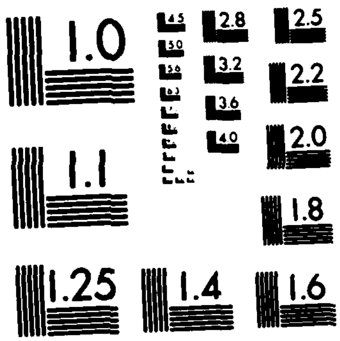

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US Army Corps of Engineers
Kansas City District

Harry S. Truman Dam and Reservoir, Missouri

By Illinois State Museum Society
Springfield, Illinois

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Holocene Adaptations Within the Lower Pomme de Terre River Valley, Missouri

Volume III

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Marvin Kay, Editor

June 1982

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Excavations at Rodgers Shelter were conducted intermittently beginning in 1963 and ending 1976. The major work was completed in four summer field seasons, from 1964 to 1968. Excavations in excess of 9 m defined a sequence of human habitation that spans the past 10,500 years. Limited excavations were conducted in 1974 and 1976. The 1974 excavation dealt mainly with Phillips Spring. The 1976 excavation was part of the Corps of Engineers mitigation program for Rodgers Shelter, a National Register Site.

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This report is a synthesis of the available knowledge gained from excavations and ancillary studies of the environment of the Ozark Highland/ southern Prairie Peninsula region. Data from previous studies are incorporated and assessed in light of new radiometric and stratigraphic controls for Rodgers Shelter and Phillips Spring. This research has altered, modified, and, on occasion, rejected previously held hypotheses, and has advanced ones of its own for future consideration. New information was collected that will allow for a reformulation of cultural process and taxonomy in this region.

Research reported includes historical vegetation reconstruction; ethnobotanical and faunal identification; clinial variation in gastropods and small mammals; examination of sediments; Holocene palynology; technological, functional and stylistic studies of major stone industries; and synthetic statements of site activity and activity areas.

The results of these often disparate studies promote and balanced view of how man existed for several millennia in a physiographically varied region that underwent considerable change of its own.

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CHAPTER 12

FEATURES AND FACTORS: ACTIVITY AREA DEFINITION AT RODGERS SHELTERS

Marvin Kay

A key to understanding site function is its "community layout" of architectural and other cultural features. For Rodgers Shelter, this presents a difficult problem because there are small numbers of architectural features in most cultural horizons, each horizon represents a span in time rather than a discrete slice of a cultural continuum, and many of the more subtle but areally extensive activities are not readily discernable from either inspection of field notes or simple plotting of single artifact categories. These issues, however difficult, are not insurmountable.

In this chapter, I present an analysis and descriptive summary of "activity areas" at Rodgers Shelter and assess for individual horizons tasks performed beneath the overhang and/or to its immediate front on the Rodgers terrace. *Activity areas* are defined as *a spatially identifiable locus where an event or events occurred.* They are complex and differ from both activities or activity indicators, in the sense of Ahler and McMillan (1976:192-197). Activity areas may represent several activities, viewed archaeologically by activity indicators, or but one. Exactly what transpired may be only partly knowable but, within the limits imposed by archaeological contexts, it should be possible to identify certain activities, or sets of activities, for single areas as well as judge relationships among several areas. The objective will be to search for larger subtle patterns not readily discernable from inspection of the few architectural features, and will be implemented, in part, by multivariate analysis of aggregated data for excavation units in these two site areas. Prime analytical problems will be (1) to differentiate within defined areas material components of an on-the-spot activity from secondary refuse that is "transported away from its location of use and discarded elsewhere (Schiffer 1976b:64)," and (2) to assess the coevalness of material components within and between discrete areas.

Excavation data summarized in Chapters 10 and 11 are minimally sufficient for my purposes, though it is recognized that not all potential activities could be represented by analysis restricted to the nonbiotic material inventory. Principal components factor analysis is the prime approach employed in reducing these data and in highlighting multivariate relationships that, once mapped, define various "activity areas" for the Rodgers Shelter block excavation. A similar approach has been taken by Anderson and Shutler (1977). To a degree, this analysis is an empirical extension of ideas discussed by Schiffer (1975b).

A computerized mapping program, SYMAP (Dougenik and Sheehan 1975), has been employed in plotting individual data points and chloroplethic summaries of aggregated counts for various artifacts (maps not presented) as a preliminary phase of this analysis. In this chapter, the more sophisticated chloroplethic maps are used to highlight differences in

spatially defined activity.

A thorough discussion of field-defined features will also be presented both as a partial check on the multivariate patterns defined by factor analysis and as a means to define activities and activity areas not considered by the data summarized in Chapters 10 and 11. These features, in part, are examples of what Schiffer (1972:160; 1975b:64) calls *de facto* refuse, or "materials...simply left when an activity area is abandoned." There is perhaps no single more valuable piece of evidence.

SAMPLING

Within any one horizon, excavation units are mainly contiguous five foot squares. The maximum number of squares is 43 in horizon 3; the minimum, five in horizon 11. The average number is 32.45 with a standard deviation of 13.72. For the subset of horizons 1-3, 5-8 the mean is 40.57 squares with a standard deviation of 2.299; the average area is 1014.25 ft.^{2} (94.23m^2). If the excavations (Fig. 4.2a) were bounded by rectangles, selection of grid squares in horizons 1-3, 5 and 6 would be highly non-random (χ^2 = 34.727 to 43.213, df = 63, p = 0.0022 to 0.0295); whereas grid squares in horizons 7 and 8 would be randomly distributed (respectively χ^2 = 31.82, df = 56, p = 0.9962; χ^2 = 36.749, df = 56, p = 0.9782). This alone suggests that interpretation of activity areas with respect to the overhang may well be skewed by nonprobabilistic sampling in all but horizons 1 and 8. This potential problem will be discussed individually for each horizon.

FIELD DEFINED FEATURES

Not counting possible post molds, there are a number of features which were identified during excavation that include both natural soil disturbance and artifacts of cultural activity. In Table 12.1, these are individually listed; feature type designations are those recorded in the field. From this listing, I have abstracted thirteen basic cultural feature types, defined in Table 12.2. Table 12.3 summarizes these cultural features and includes all potential or problematic features such as "hearth?", for a total of 71 features or feature areas.

DALTON

Dalton horizon 10 produced the greatest number of architectural and other features found in the course of Rodgers excavation. The majority are in front of the overhang on the Rodgers terrace and several are in the alluvium abutting against the talus slope. Twenty-one Dalton feature areas are either hearths or are remnants of burning or the scattering of ashes, charcoal, calcined bone and bits of burned clay. Several hearths have "aprons" of loosely consolidated ash and charcoal in a down-slope location to an intensely fired area. This is perhaps indicative of washing due to a rain or river flooding shortly after a hearth was used. The absence of post molds and the local character of these hearth apron areas imply that the former process, rainfall on unprotected hearth areas, is most plausible. Secondly, because not all

TABLE 12.1

Summary of Rodgers Shelter Features

Horizon	Feature Type	Catalog No.	Correlative Level+	Stratum	Provenience	Datum Depth	Remarks
1	Rock-lined hearth	5485	3 wt	4	220NW380	6.9-7.2	
3	Large pointed post ?	589	5	4	225NW105 & 230NW105		Feature 1
3	Burial (1)	1831	6*	4	260NW105 & 265NW105	3.0-3.5	See Base & Rhule 1976
3	Burial (2)	1905	6*	4	265NW105	3.1-4.0	See Base & Rhule 1976
3	Burial (3)	10024	6*	4	270NW115	3.25	
4	Mussel shell concentration	5224	9-10*	3	255NW85 & 2555NW90	6.0	
4	Refuse pit (?)	5418	9-10*	3	260NW70, 265NW60, 260NW75, 265NW75	3.25-6.15	5100±400 B.P. (M-2332)+ 5200±200 B.P. (M-2281)
4	Pit or rodent burrow	9919	7-10*	3	245NW100		Possibly natural
5	Rock-lined hearth	1835	11*	2	260NW100, 265NW100		
5	Rock-lined hearth	3183	12	2	220NW100	12.98	
5	Filled rodent den?	5223	14	2	220NW75	15.1-16.3	Probably natural
5	Hearth	5315	11*	3	260NW90, 265NW90, 260NW95 & 265NW95	5.7-5.8	6300±590 B.P. (ISGS-35)
5	Two antler tines	5877	8 wt	2	220NW380	11.2	Small cache?
5	Tree tap root?	9920	11*	2	235NW115		Probably natural
6	Rock-lined hearth	1954a	12*	2	265NW100	6.7-7.2	
6	Dog burial	2540	15	2	240NW115& 245NW115	10.34-10.5	See McMillan 1970
7	Hearth	1730	18	1	235NW115		

TABLE 12.1 (continued).

Horizon	Feature Type	Catalog No.	Correlative Level+	Stratum	Provenience	Datum Depth	Remarks
7	Ground hematite	5652	16*	1	260NW95	9.0-9.5	
7	Hearth	5682	16*	1	260NW95	9.3-9.5	
7	Burned stone pile	6664	13*	1	255NW85	6.71-7.85	
7	Rock-lined hearth	7389	16*	1	255NW85	9.0-9.5	
7	Hearth areas	7539	14*	1	260NW90	8.0-8.5	Redigging?
7	Stone pile	7587	15*	1	265NW90	8.0-8.5	Hearth areas? at shelter wall
7	Two hearths?	7707	18*	1	255NW85	10.0-10.5	
7	Hearth areas	7743	16*	1	260NW90 & 265NW90	9.0	
7	Hearths	7902	16*	1	260NW90	9.0-9.5	Archeomagnetic samples taken
7	Hearth	9159	16*	1	260NW85	9.0-9.7	See Ahler & McMillan 1976:197
7	Hearth and hematite processing area	9918	14*	1	260NW100		
7	Fired clay area	9975	18*	1	260NW85	10.0	Archaeomagentic samples taken
7	Fired clay area	9976	18*	1	260NW85	10.0-10.1	
7	Burned tree stump	11476	13 wt	1	220NW405	14.5-15.9	Probably natural: 8030±150 B.P. (SMU-461)
8	Burned log?	3758	19	1	240NW110	12.0-12.5	
8	Scatter of bone and artifacts	3851	20	1	240NW105, 245NW105	12.4-12.8	Human and animal bone
8	Hearth	3880	24	1	240NW100	14.5-15.0	
8	Rock-lined hearth	3963	23	1	240NW105	14.0-14.3	
8	Charcoal basin smoke pit?	3977	24	1	240NW105	14.5-14.82	Date 8030±300 (M-1900)
8	Rock scatter	4461	25	1	225NW110	15.0-16.0	
8	Hearth	5823	19*	1	260NW95	11.48-11.68	

TABLE 12.1 (continued).

Horizon	Feature Type	Catalog No.	Correlative Level+	Stratum	Provenience	Datum Depth	Remarks
8	Hearth	6026	19*	1	255NW90	11.4-12.15	
8	Antler cache	8233	19*	1	260NW90	11.0	See Ahler and McMillan 1976:196
8	Hearth	9921	19	1	240NW115	12.0	
9	Hearth?	4413	26	1	230NW110, 235NW110, 230NW115 & 235NW115	15.3-15.5	
9	Chert knapping area	4478	27	1	230NW115 & 235NW115	16.0-16.5	
9	Charcoal concentration	4615	34	1	220NW104 & 225NW105	19.5-20.0	
9	Hearth and charcoal scatter	4616	35	1	235NW115, 235NW110 & 230NW115	19.0-19.5	
9	Hearth	5203	34	1	235NW95	20.6-20.8	
10	Hearth	2120	39	1	230NW100	23.2-23.7	First Dalton component
10	Hearth	2124	40	1	230NW100	23.7-24.1	Second Dalton component
10	Hearth	4153	39	1	240NW105	18.5-19.0	
10	Hearth	4202	39	1	240NW105 & 240NW110	18.5-19.2	
10	Hearth?	4293	39	1	250NW115	15.0	
10	Burned areas	4302	36	1	215NW100	20.5-21.0	
10	Burned area	4373	37	1	210NW100	21.0-21.5	
10	Charcoal concentration	4579	39	1	240NW115	18.5	
10	Burned area	4654	39	1	240NW115	20.0-20.5	
10	Hearth	4648	39	1	240NW105	20.0-20.5	
10	Charcoal concentration	4720	39	1	240NW115	21.4	
10	Charcoal smears	4780	39	1	225NW100	23.84-24.0	
10	Hearth?	4879A	39	1	230NW110	23.0-24.0	

TABLE 12.1 (concluded).

Horizon	Feature Type	Catalog No.	Correlative Level+	Stratum	Provenience	Datum Depth	Remarks
10	Hearth?	4887	39	1	230NW115	23.5-24.0	
10	Occupation surface	4934a	40	1	225NW95	24.6-24.85	
10	Bone concentration	5822	39	1	235NW80	20.58	Trumpeter swan, more of Feature 6271
10	Trumpeter swan bone area	6271	39	1	230NW80, 230NW85	21.32-21.72	
10	Charcoal lens	6389	22*	1	255NW100	12.6-13.0	
10	Fired clay area	6492	21*	1	255NW90	12.05-12.10	
10	Charcoal concentration	6763	39	1	230NW95	22.5-23.0	
10	Chert knapping area	6991	23*	1	255NW95	13.0-13.5	
10	Hearth area	7799	40	1	225NW80	24.4	Combined with general level 8259: 10,530±650 B.P. (ISGS-48)
10	Two hearths	8049	41	1	235NW90	24.9	
10	Rock concentration	9450	21*	1	255NW85	11.6-12.0	
10	Hearth	9981	21*	1	260NW85 & 255NW85	11.5-11.85	
10	Chipping area	9112	42	1	235NW90	26.0-16.5	
11	Hearth	9163	42	1	225NW95	28.5-29.0	
--	Rock-lined hearth	3184	14 t	2	215NW100	13.61	
--	Possible house pattern	4281	13 t	2	190NW115, 195NW115, 190NW120, 195NW120	12.6-13.0	
--	Hearth	5311	8 t	2	210NW210	8.25-8.45	
--	Rock concentration	5628	11 t	2	210NW130	12.1-12.5	

+ Main excavation; no prefix
Shelter: *; Terrace: t; West terrace: wt

TABLE 12.2

Generalized Cultural Feature Definitions

Feature Type:	Definition:
Human burial	Purposefully prepared inhumation
Dog burial	Purposefully prepared grave
Mussel shell concentration	A localized area densely packed with mussel shell
Bone and artifact scatter	A surface of general occupation debris, synonymous with occupation surface
Rock concentration	Area of unknown function with concentrated rock, rock piles or scatters; rock may be burned or unburned
Chert knapping area	Irregular "surface" having concentration of lithic debitage and cores
Antler tine caches	A restricted area having multiple antler tines stacked or placed next to one another, probably these were part of a flintknapper's tool kit
Hematite grinding area	Irregular surfaces with concentrated powdered hematite and grinding slabs possibly associated with hearths
Bone concentration	Irregular area of animal bone that may represent butchering, food preparation, or discard of uneaten or unused elements
Hearth	Prepared fired area or one that due to use becomes characteristically burned and may or may not be associated with a scatter of charcoal. Hearth areas generally have burned clay and/or charcoal within a shallow basin of variable dimensions
Rock-lined hearth	Similar to other hearths but the basin or hearth surface is lined with rock
Fired clay or burned areas	Irregular oxidized surfaces or zones of charcoal that are a product of burning but lacking characteristic basin shape of hearths
Possible house pattern	A large, regularly shaped fired area with interior hearths but no defined wall posts

hearths have associated ash-charcoal scatters, it is doubtful that each was in use at the same time, though the overall period of Dalton occupa-

TABLE 12.3

Summary of Generalized Cultural Features

Feature Type	Horizon											Stratum 2	
	1	2	3	4	5	6	7	8	9	10	11	Terrace Excavations	Total
1. Human burial			3										3
2. Dog burial						1							1
3. Mussel shell concentration				1									1
4. Bone and artifact scatter								1		1			2
5. Rock concentration							2	1		1			4
6. Chert knapping area									1	2		1	4
7. Antler tine cache					1			1					2
8. Hematite grinding area							2						2
9. Bone concentration										2			2
10. Hearth					1		8	5	2	12	1		29
11. Rock-lined hearth	1				2	1	1	1				1	7
12. Fired clay or burned areas							2		1	9		1	13
13. Possible house pattern												1	1
Total	1		3	1	4	2	15	9	4	27	1	4	71

tion with any one living floor was probably of short duration (i.e., within a single season). Other features include two chert knapping areas, both having high concentrations of lithic debitage in small areas of roughly one-foot diameter, and bone concentrations. One of the bone concentrations was assigned two catalog numbers (5822 and 6270) as the major elements occurred at slightly different depths in adjacent grid squares. But the planar orientation of elements in these squares and subsequent identification as trumpeter swan indicates that probably no more than a single swan is represented.

At least two separate living floors are represented by horizon 10 terrace features; an even earlier hearth occurs in horizon 11 as well. Two hearths at depths of 23.2 - 23.7 feet and 23.7 - 24.1 feet below datum were excavated in Sq. 230NW100, with one hearth stacked on top of the other and separated from it by a thin lens of alluvium. Three hearths were similarly positioned in Sq. 240NW105, possibly representing three individual living floors. A second idea is that repeated use of single hearth areas is evident from these examples. In which case, we might assume that the same group returned after a relatively short absence or, alternatively, that an old hearth was intentionally covered prior to reuse. Probing on the west terrace also identified as many as four deeply buried floors, which are without doubt Dalton age. Unfortunately, because of varying elevations of features and because of the limited extent of occupational debris normally found with hearth or burned areas it is impossible to accurately determine the relative ages of Dalton terrace features outside of Sqs. 230NW100 and 240NW105.

Fragments from three mended bifaces, all from feature areas within horizon 10, were separated, respectively, by horizontal distances of 2.3 feet, 3.7 feet, and about 5.0 feet and were no more than 0.7 feet vertically. This further indicates that each feature area is essentially discrete and that inter-feature correlations are largely unsupportable. Beneath the overhang stratigraphic relationships in horizon 10 are even less clear cut (McMillan 1976:223), and this continues to be a problem with shelter features from the younger horizons.

In sum, though these data are minimal, they do not support the idea that individual feature areas are representative of larger scale contemporaneous occupation of the shelter and adjacent terrace areas, a possibility perhaps at Dalton sites excavated in other regions (Goodyear 1974; Morse 1973: but see Schiffer 1975a). Nor is there any evidence of walled structures, and the shelter itself appears to have been a prime area affording limited protection from the elements. Each hearth appears to be a remnant of a nuclear domestic area of very short duration; what McMillan (1976:223-224) terms ephimeral campsites. Presence of charred hickory and black walnut hull fragments in some of the shelter hearths (Parmalee *et al.* 1976:142) suggest an autumn seasonal use of the site, which finds additional support in the occurrence south of the overhang of migratory water fowl.

POST DALTON HORIZON 9

Four features, three small hearths and/or charcoal scatters and one chert knapping area, occurred in the horizon 9 excavation. All are south of the overhang, and represent a minimum of two living floors of

different ages, with features 4615, 4616 and 5203 possibly defining a single occupation immediately following Dalton horizon 10 and features 4413 and 4478 comprising a later activity area of a hearth associated with a chert knapping scatter. Though these features are not identifiable as Dalton, the basic pattern of site use seems to be the same.

EARLY ARCHAIC HORIZON 8

Horizon 8 is the first well defined expression of an Early Archaic complex, a departure both in terms of point styles and features from the preceding Dalton. Of the nine cultural features, six are hearths. Two of these are directly beneath feature 3851, a bone and artifact scatter, in Sq. 240NW105, including one which is described as a problematic smoke pit and is dated at 8030±300 B.P.; thus, at least two separate living floors are apparent for horizon 8. Hearths were found beneath the overhang and to its front. One shelter hearth (5823) was situated in a crevass between two large slabs of dolomite fall rock which may have aided in either retaining or in vertically channelizing heat. For none of the hearths or for the excavation as a whole were post molds identified, and it is inferred that terrace hearths were neither enclosed nor protected.

Two of the remaining features are of special interest. Feature 8233 is a shelter area cache of five cut antler tines which were neatly stacked in a small pile, with three tines placed in one direction beneath two others going in the opposite direction. Perhaps the antlers were placed in a bag or were bound together. The tips and shafts of the tines are polished and striated. While this kind of wear occurs as a product of natural use, in this case, individual tines were probably used as pressure flaking tools. One of the tines is rodent gnawed. This apparently occurred shortly after the antlers were cached as rodents will normally consume detached and exposed green antler to get calcium. This may further indicate that the antlers were left exposed to the atmosphere and were not covered by soil immediately after caching. Six inches south of the cache was a hematite processing slab fragment (8242).

The second feature, the scatter of bone and artifacts (3851), is a highly problematic concentration of cultural debris. Included is one finely flaked and very large Rice Lobed point (Category 24, Chapter 11) near a few elements of human bone, a bison tooth and other non-human animal bone in the north half of Sq. 240NW105. Identified taxa from this area include: human bone (humerus and tibia? sections); large bird, probably turkey (tibiotarsus and tarsometatarsus sections); terrapene (one shell fragment); cottontail rabbit (skull, tibia sections and teeth); squirrel (humerus, calcaneum, and radius section); bison (tooth); and a pharyngeal bone fragment from a freshwater drum. A second, associated concentration in the south half of Sq. 240NW105 included: deer (pelvis and sacrum sections); bison (a phalanx); cottontail rabbit (teeth and ulna and radius sections); terrapene (shell fragments); turkey (ulna and corocoid sections); *Canis* (premolar); and squirrel (radius section). These species are significant because they indicate use of both large and small mammals from a number of habitats, including tall grass prairie at this time, as well as our first documentation of fish. The occurrence of human elements appears to be simply a part of

the larger faunal inventory. No burial, *per se*, is indicated. Isolated human bone also was found in horizon 8 elsewhere in the excavation.

A maximum age for feature 3851 is 8030±300 B.P. (M-1900), the date from the hearth or smoke pit 1.7 feet below. A second date of 8100±300 B.P. (A-868-A) is from approximately the same depth (D.D. 12.5 feet) as the feature from the base of horizon 7. It seems plausible that M-1900 is actually somewhat older than its mean age of 8030 radiocarbon years B.P. I assume that the age of feature 3851 and the second horizon 8 component is slightly older than 8100 B.P., which marks the initial encroachment of tall grass prairie into the uplands in the Rodgers Shelter locale.

EARLY OR MIDDLE ARCHAIC HORIZON 7

Horizon 7 is the last cultural unit to have large numbers of features, and is second only to Dalton horizon 10 in this respect. It may be noted that horizon 7 marks a cultural florescence which has stylistic underpinings first seen in horizon 8 and that continued until the end of the Middle Archaic (horizon 5). The relative dirth of architectural features in subsequent horizons may be due to an increase in the intensity of site use during the Middle Archaic and destruction of architectural features by later inhabitants.

All but one of the fifteen feature or feature areas are beneath the overhang. Hearth or burned areas comprise the majority and there are distinctive hematite grinding areas as well. A minimum of three or four stratigraphically superimposed living floors are indicated by overlapping features in Sqs. 255NW85 and 260NW90. But outside of these two squares stratigraphic relationships are largely obscured by either an irregular ground surface and/or later redigging of hearth and adjacent domestic areas. The majority of the unlined hearths and burned areas are within a foot or two of the back wall of the shelter, are intensely fired, and have associated patches of redeposited ash and chunks of burned clay. Seemingly, hearths near the shelter back wall were periodically scraped clean and then relighted. The shelter wall itself probably served as a retainer and reflector of heat and the near proximity of hearths suggests that this had functional significance. Conversely, the rock-lined hearths and piles of fired rock, which would have retained heat after the fire had gone out, are at a distance from the back wall of the shelter.

Two hematite grinding areas were delineated at differing depths but in adjacent squares. These may or may not represent a single episode but, regardless, they share many attributes in common. Quantities of powdered hematite, hematite stained grinding slabs, bits and pieces of ground hematite that occur in these areas attest to the fact that these features were prime hematite reduction centers. Hearths are adjacent and may or may not be associated. Their presence, however, does support the notion that chunks of hematite were purposely fired both to enhance its color and to make it softer.

Three possible structures are also defined by placement of "fall rock" near the shelter dripline. These were not recognized as such

in the field, but became apparent in replotting individual grid level summary floor plans for shelter correlative levels 13 and 14 onto master diagrams for the entire shelter excavation.

Using the term advisably, Structure 1 consists of a nearly circular ring of stones (Fig. 12.9) with an interior diameter of about 5.0 feet (1.5 m) about 2.5 feet north of the point of maximum shelter overhang, in correlative level 14. There were no "intramural" features but six *in situ* artifacts were plotted within the ring while plotted either associated with the ring or no more than 0.5 feet at its outside were eighteen *in situ* artifacts (Table 12.4). This strongly indicates a non-random configuration of material items, as though the interior surface was swept clean or the ring itself blocked or channelized the distribution of *in situ* items. Most ring artifacts are on either the east or north sides.

TABLE 12.4

In situ items from horizon 7 "structures"

Artifact Type	Structure 1 "Intra-mural"	Structure 1 "Wall"	Structure 2 "Intra-mural"	Structure 2 "Wall"	Structure 3 "Intra-mural"	Structure 3 "Wall"
1. Hematite		3	3			
2. Hematite grinding slab	1	4				
3. Groundstone fragment					2	
4. Hammerstone		1	1			
5. Core	1	2	3	2	3	2
6. Biface preform	1	3	2			2
7. Notched preform		1				
8. Projectile point			3			1
9. Point tip	1		1			
10. Scraper	1	1	1			
11. Utilized flake	1	2	4	4		
12. Galena			1			
13. Bone		1				
14. Tooth			1			

About five feet east is Structure 2 (Fig. 12.1a). Its southeast perimeter is directly below the dripline and parts of the "wall" are in unexcavated grid squares. Enough of the feature is exposed to establish that it, too, is nearly circular in outline with an inteior diameter of roughly five feet. In contrast to Structure 1, most *in situ* artifacts (Table 12.4) were randomly distributed within the interior of the structure, a few *in situ* items occurred along the wall at the shelter dripline. There were no interior features.

Structure 3 (Fig. 12.1b) in correlative level 13 above Structure 2,

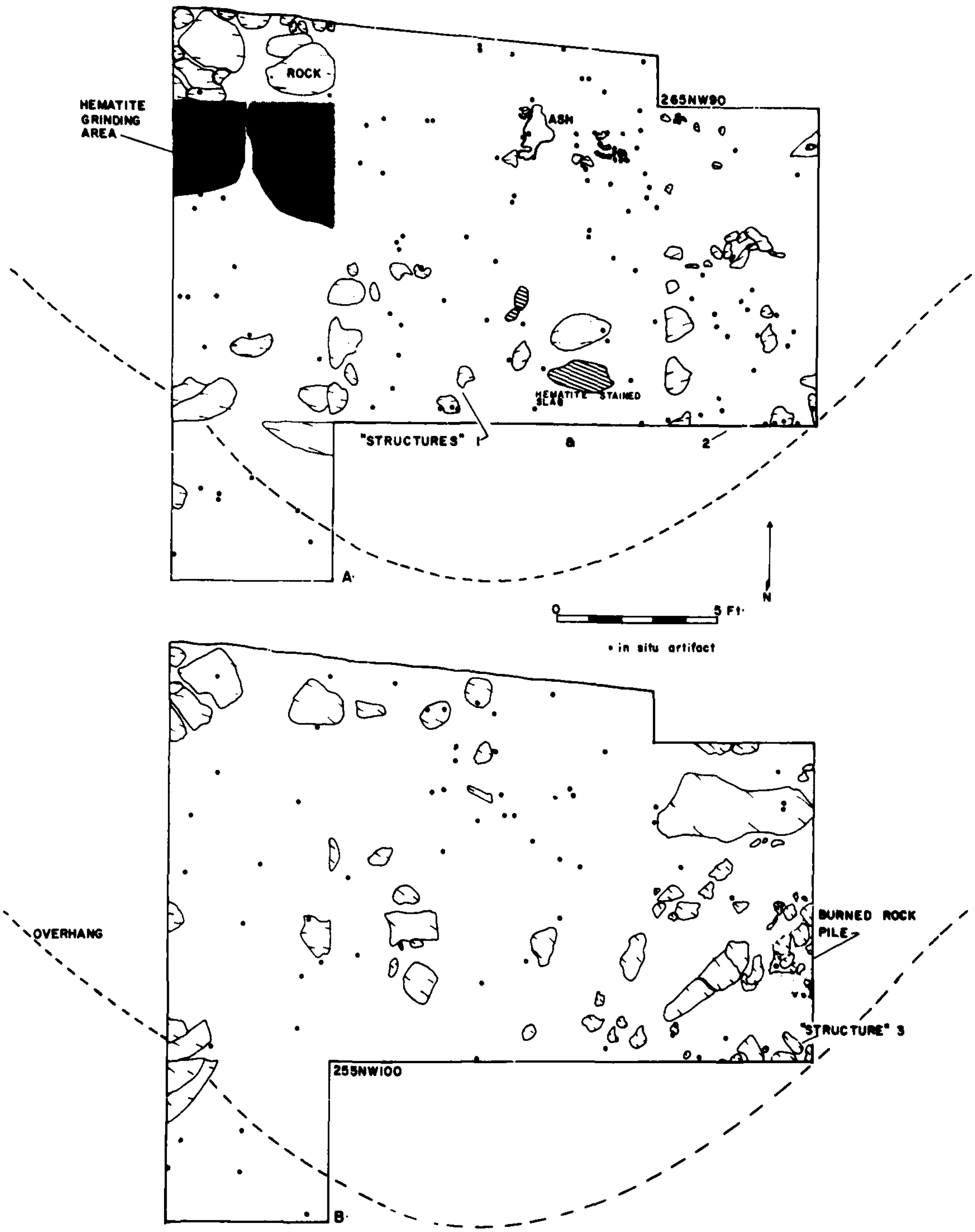

Figure 12.1. Composite schematic diagrams of horizon 7 shelter excavations taken from individual grid level summaries and field catalog; a. correlative level 14; b, correlative level 13 (*in situ* items indicated by filled circles).

is oblong in shape and continues into grid squares on the east side of the shelter excavation. Full dimensions are unknown but the exposed portion is larger than either of the two preceding structures. Assuming that the main axis is east-west, Structure 3 has a maximum width (north-south) of about 6.7 feet (2 m). An "intramural" feature is a rock-lined hearth or burned stone pile (6664), and most interior *in situ* artifacts (Table 12.4) are associated with feature 6664. The rest of the interior surface seemingly was cleared of debris and a relatively small number of *in situ* items were found along the south wall.

Assuming for the moment that these rock alignments do represent walls, the facts that no post molds were identified in the course of excavation and that at least two of the three were wholely protected by the shelter would argue that the walls were rudely constructed of unburied vertical supports wedged between the rocks and covered by brush or skins. No wattle-and-daub was found at any rate which might indicate a more substantial wall construction. Nonetheless, use of fall rock as a building material is documented by the horizon 6 dog burial (McMillan 1970) which is covered by a rock cairn. The small sizes of the first two structures may also argue for unknown specialized functions for these enclosures, while the larger size with a more-or-less central rock-lined hearth or burned stone pile in the third may indicate a more conventional use as a dwelling area.

Horizon 7 clearly marks a period of intense, repeated or sequential usage of the shelter on an order of magnitude not previously recorded. The proximity of unlined hearths to the back wall of the shelter, their later disturbance and reuse seems to be a functional correlate of the rock-lined hearths found at greater distances from the back wall, in which production and retention of heat is perhaps equally served. The potential presence of walled enclosures near the dripline with one having a centralized(?) burned stone pile might be interpreted too as attempts to maximize heat retention within a controlled area though other explanations are, of course, possible (i.e., dwelling unit, or ceremonial? enclosures). Alternate considerations of these possible structures would nonetheless not exclude their having served as heat retainers, or as a barrier to the elements. These data may be construed as seasonal indicators of site use during the fall and winter, a hypothesis also supported by two other kinds of evidence.

First, hematite was apparently available in surface exposures on hillslopes and in dry creek beds. Vegetation would have been less lush in the fall-winter months and thus would favor hematite procurement on a seasonal basis. The facts that industrial processing of hematite occurred beneath the shelter and was closely aligned with many adjacent hearth areas suggests this was synchronous with fire maintenance activities.

Second, charred plant remains (Parmalee *et al.* 1976:142) from horizon 7 shelter excavations include nut hulls of hickory, black walnut, acorns (oak) and seeds of hackberry, grape, persimmon and black cherry. All of these mature either in mid to late summer or after the first frost in the fall. Shelter inhabitation from late summer through autumn and perhaps winter is inferred. This is a persistent seasonal pattern which began with the first shelter occupation by Dalton groups and con-

tinued into the final Mississippian period.

Relative to preceding horizons, horizon 7 is a radical departure. First there appears to have been large scale usage of shelter areas, accompanied by construction of enclosures or walled dwelling areas. Hearths became functionally specific and their construction and maintenance was keyed to structural prerequisites governed, in part, by relative proximity to the back wall of the shelter, which served as a retainer and reflector of heat; rock-lined hearths were well away from the back wall and possibly were enclosed within structures. These activities centering on the shelter allowed for sustained seasonal encampment of perhaps several months from early fall to well into the winter. This became an established annual pattern involving sequential reoccupation of the shelter. A prime industrial activity was the processing of hematite into powder by grinding on abrasive, hard sandstone slabs. Other ground stone implements became integral components of extractive tool kits for vegetable food processing.

MIDDLE ARCHAIC HORIZON 6

Only two structural features were identified in horizon 6, a rock-lined hearth beneath the overhang and a dog buried in a prepared grave. McMillan (1970) has previously described the latter as one of the earliest canid burials in North America, dating to about 7500 B.P. The hearth was adjacent to the shelter back wall and has a surrounding ring of rock that seemingly contained the fire; presumably this illustrates the same functional relationship of horizon 7 back wall hearths. No prospective rock alignments were noted in redrafting excavation floor plans for this or any of the younger horizons.

MIDDLE ARCHAIC HORIZON 5

Three hearths were delineated, two beneath the shelter and one on the terrace near the south end of the block excavation. Two shelter hearths are either near or almost adjacent to the back wall and were primary charcoal concentrations, one bordered wth dolomite rock; Hearth 5315 is at the Strata 2-3 contact and is dated at 6300±590 B.P. (ISGS-35). The terrace hearth is rock-lined or covered and seemingly served as a secondary stone heating facility as previously discussed for horizon 7. The final cultural feature is a potential cache of two antler tines from a west terrace excavation.

HORIZON 4

Features within horizon 4 (Stratum 3) were recognized in two separate shelter areas and at differing depths. Both areas apparently represent discrete occupation floors of short duration, possibly are coeval, and were first encountered during mechanical removal of Stratum 3 sediments in 1968. The mussel shell concentration consists of a scatter of shells, a few bone fragments and undiagnostic chipped stone artifacts at depths ranging from 5.16 to 6.22 feet below datum mainly in Sqs. 255NW105 and 255NW110 but also continuing to the south into

unexcavated deposits. Identified valves are tabulated in Table 7.4 and are discussed with the other freshwater mussels in Chapter 7. The second feature, an elongated basin that sloped to the southwest (5418), was to the east, centered on the 265NW75 grid intersection, the west part of the pit was cut away by a backhoe. The walls of the depression were well defined and originated from an occupational layer at depths of between 3.6 and 4.1 feet below datum, basined out at about 5.1 feet, and attained a maximum depth of 6.15 feet. Undiagnostic artifacts including chipped stone, hematite, bone and more mussel shell were collected along with four charcoal samples, two of which were dated at about 5200 B.P. The feature may be either a natural depression or a purposely excavated pit that contained small amounts of refuse. A second depression was directly above at least a part of feature 5418 and may have represented either differential settling of feature 5418 or, perhaps more likely, a rodent burrow in the upper part of Stratum 3.

LATE ARCHAIC HORIZON 3

Three human burials (Fig. 12.2) were found near the base of horizon 3 beneath the overhang. Burials 1 and 2 have been thoroughly analyzed and described by Bass and Rhule (1976) while the third burial, excavated in 1974, has yet to be described or analyzed. All three burials are flexed and on their sides; burials 2 and 3 were placed in shallow pits; no pit was discernable for burial 1. Burials 1 and 3 had been badly disturbed by rodent activity prior to excavation; the skull and a number of limb bones are missing for burial 3. Burial 3 was partially covered by four large dolomite slabs which may have been remnants of a cairn. Similar structures were not noted for the first two burials but several large rocks that surround the pit of burial 2 appeared to have been normal breakdown from the ceiling with the pit dug between them. Burials 1 and 3 had several possibly associated utilitarian items placed either near the skull or where the skull would have been; with burial 1 having two points, a scraper and an ovate biface and burial 3 having a point and a mano. Above the legs of burial 3 were a perforator base and a lateral biface segment. No grave goods occurred with burial 2. The three burials have no consistent orientation though burials 2 and 3 faced west with heads to the north; burial 1 faced east with heat to the south. Bass and Rhule describe burial 1 as an adult female about 35-45 years old with undetermined stature but who had lumbar arthritis, extreme tooth wear, missing teeth and abcesses; extreme tooth wear was considered highly noteworthy and unusual. Burial 2 is described by Bass and Rhule as an adolescent male of about 14 years, approximate height of 157.1 to 164.7 cm (5 ft. 1-3/4 inches to 5 ft. 4½ inches) who "probably had been ill or suffered from malnutrition before puberty (1976:208)." Presence of grave goods with the adult female suggests role differentiation primarily by age and not sex.

Charcoal from the same level as burial 3 has been dated at 3460±60 B.P. (SMU-510), which is in close accord with the date on the base of Stratum 4 from the main excavation (3580±90 B.P.; SMU-451) in 1976. Probably all three burials are approximately 3500 radiocarbon years old.

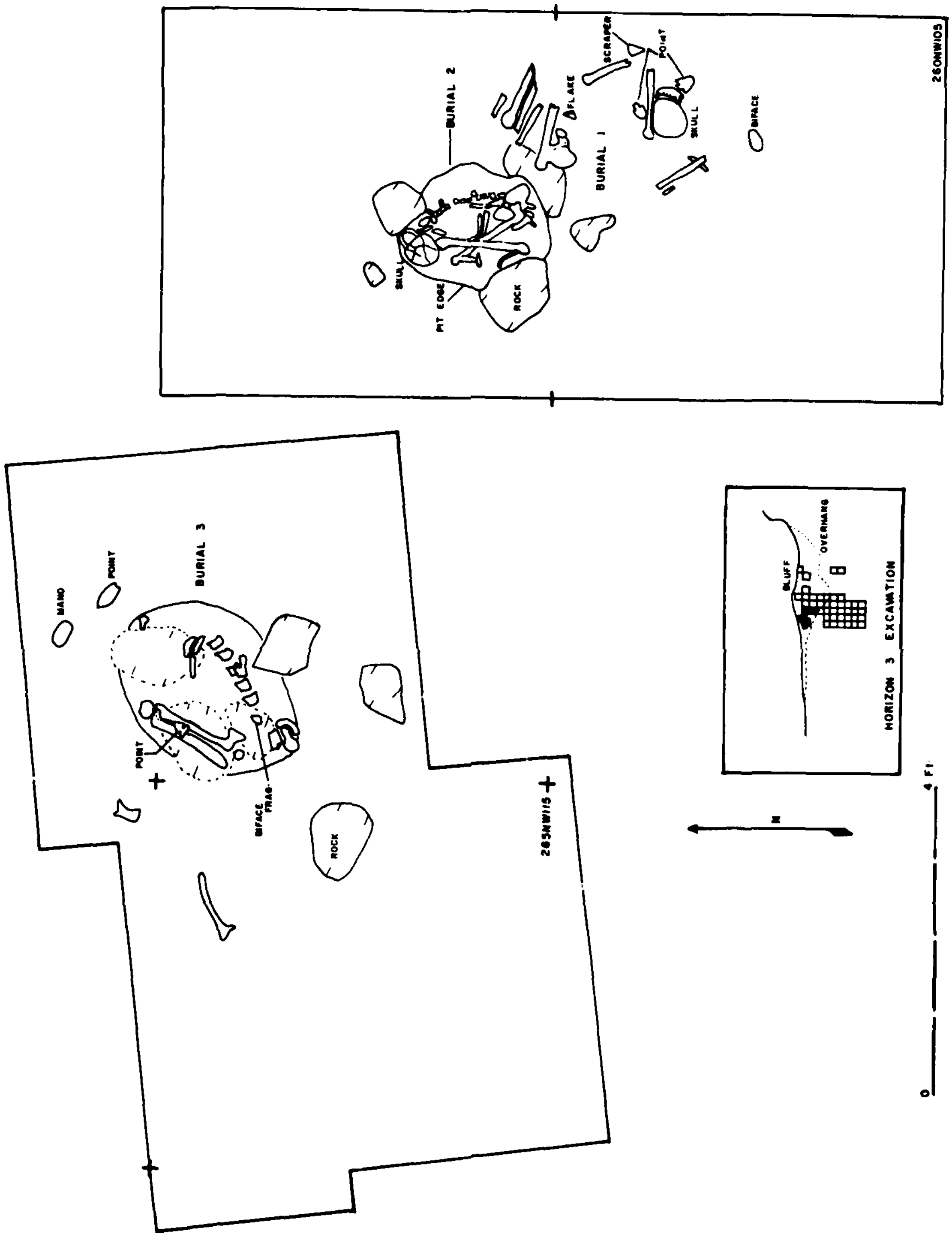

Figure 12.2. Composite map of horizon 3 shelter excavation.

WOODLAND AND MISSISSIPPIAN HORIZON 1

A cluster of burned dolomite rock from a west terrace excavation comprises the sole horizon 1 feature. No charcoal was found among the burned stones and there was little evidence that surrounding soil was fired. The feature is interpreted as either indicative of a reducing burning atmosphere or possibly as being redeposited. A deer antler handle, a flake knife, chert cores occurred in the hearth area and an adze or gouge was to the west.

MIDDLE ARCHAIC STRATUM 2 TERRACE FEATURES

Four features or feature areas were excavated on the terrace south and west of the main block. Two were either truncated or exposed by the bulldozer trench south of the block in 1966 and the remaining two were found in terrace test squares to its west in 1968. It has not been possible to assign these features to a horizon but because they all occur within Stratum 2 they are Middle Archaic in age.

One of the two bulldozer features is a "classic" rock-lined or covered hearth similar to ones excavated in horizons 5 and 7. A second burned possible hearth area was uncovered in a test excavation on the terrace as was an eliptical concentration of rock having at least some burned stones and one ovate biface fragment. The final terrace feature, and the most intriguing, is a possible house pattern (Fig. 12.3).

This is a stained ovate area containing a series of hearths with dimensions of about 7 by 5 feet. The hearths clustered toward the center and southeast end of the stain. An adze is about 1.5 feet north and a piece of ground sandstone about the same distance west. No tools were found within the stained area. The entire area and adjacent surface was repeatedly and carefully scraped and trowled in 1966 and, again, in 1967 but no possible post molds were delineated. It is considered as a possible dwelling area or analogous structure. Intensive testing of the terrace in 1968 did not reveal any comparable features.

COMMENTS

Proportionate to years of occupation or cultural horizons, Rodgers Shelter has few architectural features by which activities may be judged. Ahler and McMillan (1976:192-197) identify only four activities, pigment processing, ceremony or ritual, stone heating, fire maintenance, by reference to architectural features. As a rule, the various kinds of hearths, the most numerous architectural features, occur in the lowest cultural zones, including the Dalton horizon 10, where density of occupation was apparently low and deposition rates were highest. Pigment processing, as defined architecturally, occurred beneath the overhang primarily during the Middle Archaic horizon 7. Ceremony or ritual is represented by three Late Archaic burials mainly placed in pits beneath the overhang, and by a Middle Archaic dog burial encased in a small above-ground rock cairn. As *de facto* refuse, the hearths in particular are strong evidence of winter use of the shelter during the Early or Middle Archaic horizon 7. Moreoever, the kinds, numbers and spatial configuration of hearth areas indicate that site use changed from

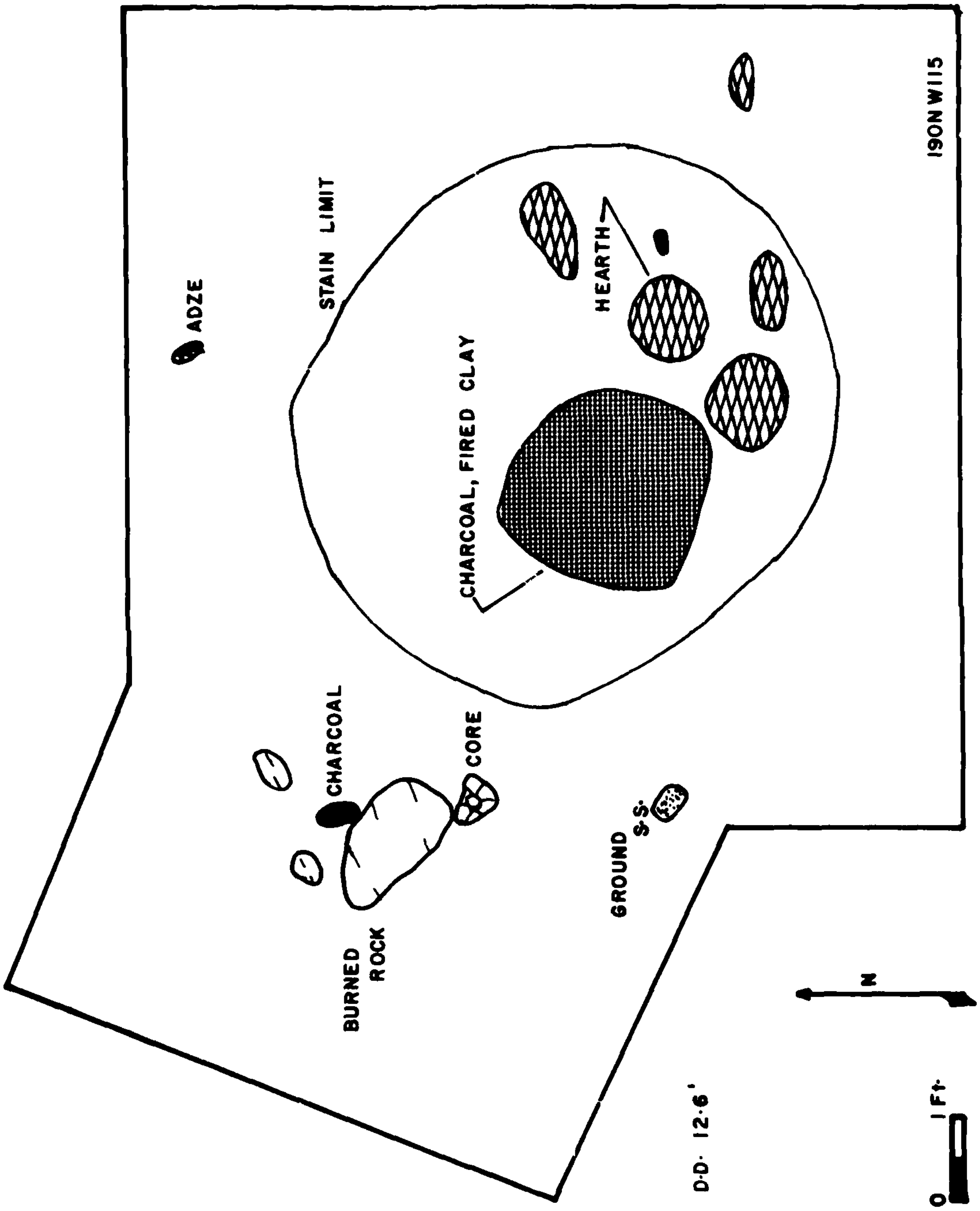

Figure 12.3. Possible house pattern, Stratum 2 terrace, exposed by bull-dozer in 1966.

initial Dalton short term camps to an Early or Middle Archaic pattern of annually repeated, longer-term seasonal usage of the shelter, perhaps augmented by construction of walled enclosures or dwelling units beneath the shelter and on the Rodgers terrace.

FACTOR ANALYSIS

Aggregated by 357 individual five foot square excavation units, there are 70 categories of material culture which were considered as potential data for factor analysis. A preliminary frequency distribution showed that 22 categories or variables, occurred in four percent or less of the 357 excavation units (i.e., less than 15 five foot squares), represented individually by one or two items per square; these 22 categories were deleted from further consideration because of small sample sizes. Three variables representing combinations of artifact pairs (including; finely flaked whole ovate preforms and barrel shaped preforms, hafted and other perforators, axes and a problematic category of grooved biface/ax), and 43 other variables (inadvertently including the category, barrel shaped preforms) occurred in greater than five percent of the excavation units and more or less large numbers and were used in R-mode principal components analysis (Kim 1975) of all Rodgers cultural horizons.

The data input matrix consists of raw counts for each of the 46 variables for 357 squares (cases); space limitations preclude its inclusion here.

Principal components defined 13 principal axis factors having eigenvalues greater than 1.0, respectively, accounting for 25.5 percent, 6.4 percent, 4.4 percent, 3.5 percent, 3.5 percent, 3.1 percent, 2.9 percent, 2.8 percent, 2.6 percent, 2.5 percent, 2.4 percent, 2.2 percent, and 2.2 percent, or, cumulatively, 64.1 percent of the total variance and were orthogonally (varimax) rotated. Loadings for the 13 rotated factors (Table 12.5) show that at best there are few truly highly correlated variables (i.e., greater than 0.750) but several variables have positive moderate or high correlations, and the factors are interpretable in terms of various kinds of "activity." The ranges in factor scores (Table 12.6) suggest as well that some of the factors are temporally specific to particular horizons. Factor scores for horizons 4, 9-11 are all negative, and by these techniques alone it is impossible to judge activity areas of these four horizons. A discussion of the rotated factors follows.

EARLY AND MIDDLE ARCHAIC FACTORS

Factors 1, 3, and 11 have basic Early and Middle Archaic distributions and are unimportant in the Late Archaic and Woodland horizons 1-3.

Factor 1 has positive moderate loadings on eight variables; to include cores, hammerstones, laterally ground bifacially thinned rectanguloid preform fragments, laterally ground finely shaped but undifferentiated preform fragments, hafted cutting tool fragments, all perforators, ground stone Factors 1 (hematite processing) and 3 (food processing). I interpret this factor as comprising the primary industrial bifacial tool and food processing areas of the Early and Middle

TABLE 12.5

Varimax Rotated Factor Matrix

CATEGORY	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13
Cores	*0.548**	0.320	0.303	0.206	0.212	0.225	0.091	0.082	0.141	0.145	0.253	0.109	-0.053
Hammerstones	*0.685*	0.128	0.070	0.194	0.350	0.078	-0.003	-0.034	0.110	0.059	0.315	0.037	-0.044
Crude Ovate Preform Fragment	0.062	0.424	-0.001	0.056	0.032	0.059	-0.118	0.318	0.091	0.426	-0.020	0.287	0.0[illegible]1
Crude Ovate Preform Whole	0.027	0.244	0.069	-0.035	*0.606*	0.018	-0.042	-0.039	0.232	0.265	-0.202	0.214	-0.078
Medium Ovate Preform Fragment	0.130	0.401	0.102	0.145	0.128	0.405	-0.080	0.225	0.155	0.240	-0.006	0.098	0.132
Medium Ovate Preform Whole	0.283	0.483	-0.026	-0.099	0.051	-0.045	0.163	0.051	0.357	0.135	-0.141	-0.094	0.158
Fine Ovate Preform Fragment	0.061	0.309	-0.059	0.070	*0.630*	0.227	-0.001	-0.035	0.229	0.216	0.047	-0.075	0.105
Fine Ovate Preform Whole & Barrel Preforms	0.143	0.023	0.034	*0.874*	0.054	0.006	0.121	0.057	0.037	0.077	-0.038	-0.062	0.041
Ground Medium Ovate Preform Fragment	0.387	0.127	-0.003	-0.078	*0.596*	0.003	0.333	0.143	0.002	0.020	0.142	-0.158	0.023
Ground Medium Ovate Preform Whole	0.212	-0.014	-0.050	0.027	0.055	0.117	-0.050	*0.684*	0.083	0.056	0.016	-0.099	0.043
Ground Fine Ovate Preform Fragment	0.474	0.125	0.003	0.203	0.354	0.200	0.034	0.232	-0.085	0.081	0.245	-0.206	0.091
Medium Rectanguloid Preform Fragment	0.033	*0.668*	0.219	0.062	0.175	-0.040	0.125	0.024	0.081	0.163	0.155	-0.058	0.128
Medium Rectanguloid Preform Whole	0.073	0.078	0.045	0.062	0.104	-0.044	0.029	-0.123	0.063	0.011	-0.083	0.196	*0.776*
Fine Rectanguloid Preform Fragment	-0.102	0.100	0.114	-0.083	0.169	-0.068	-0.138	0.262	*0.658*	0.143	-0.055	0.033	0.077
Fine Rectanguloid Preform Whole	0.063	-0.036	0.069	-0.096	0.049	-0.068	*0.603*	-0.115	-0.052	0.249	-0.070	-0.021	0.007
Ground Medium Rectanguloid Preform Fragment	*0.794*	0.089	-0.085	0.014	-0.097	-0.010	0.038	0.004	0.081	0.065	-0.039	-0.036	0.222
Ground Fine Rectanguloid Preform Fragment	0.078	0.270	*0.536*	-0.010	-0.021	0.023	-0.158	-0.072	-0.251	-0.037	-0.050	-0.120	0.056
Crude Undifferentiated Preform Fragment	0.109	*0.559*	0.123	0.042	-0.009	0.316	-0.020	-0.024	0.076	0.311	0.065	0.127	-0.076
Crude Undifferentiated Preform Whole	0.253	0.407	-0.064	0.233	0.320	-0.224	-0.053	0.097	0.104	0.164	0.303	0.038	0.030
Medium Undifferentiated Preform Fragment	0.329	0.345	0.068	0.032	0.003	0.110	0.091	0.064	0.288	0.583	0.159	0.008	-0.044

*Moderate and high loadings in *italics*.

TABLE 12.5 (concluded)

CATEGORY	FACTOR 1	2	3	4	5	6	7	8	9	10	11	12	13
Medium Undifferentiated Preform Whole	0.123	0.015	-0.076	-0.070	0.078	*0.739*	0.104	-0.034	-0.029	0.038	-0.092	0.079	-0.055
Fine Undifferentiated Preform Fragment	0.153	0.200	0.061	0.025	0.219	0.086	-0.209	0.147	0.024	*0.580*	0.252	0.075	0.216
Ground Crude Undifferentiated Preform Fragment	0.092	-0.173	0.152	0.123	*0.506*	0.021	0.177	-0.045	-0.033	0.368	0.071	0.207	0.105
Ground Medium Undifferentiated Preform Fragment	0.437	0.042	0.296	0.222	0.126	0.304	0.182	-0.027	0.097	0.375	0.339	0.108	-0.090
Ground Fine Undifferentiated Preform Fragment	*0.540*	0.056	0.151	0.256	0.106	0.277	0.177	0.037	0.162	0.191	0.290	-0.074	0.072
Projectile Point Fragment	0.028	0.205	-0.034	0.063	0.195	0.103	0.064	0.032	-0.014	0.720	-0.074	-0.174	0.000
Projectile Point Whole	0.086	0.007	-0.069	0.052	0.022	-0.093	0.218	-0.057	0.064	*0.645*	-0.006	0.067	-0.104
Hafted Cutting Tool Fragment	*0.556*	-0.063	0.119	-0.063	0.202	-0.117	0.010	0.178	-0.107	0.125	-0.259	0.201	-0.098
Hafted Cutting Tool Whole	0.079	0.120	0.049	-0.092	0.033	0.112	0.135	0.006	0.008	0.006	0.065	*0.712*	0.191
Hafted Multipurpose Tool Fragment	0.169	0.455	-0.024	0.077	0.088	0.091	0.114	-0.115	0.355	0.380	-0.032	0.215	-0.047
Hafted Multipurpose Tool Whole	0.137	0.137	-0.092	0.197	0.049	0.009	-0.000	-0.019	*0.664*	0.058	0.065	0.011	-0.018
Undifferentiated Point Fragment	[illegible]	[illegible]	0.101	0.014	[illegible]	0.171	0.146	0.017	0.301	0.455	0.139	-0.002	0.061
Hafted Scraper	0.055	0.201	0.066	0.206	0.077	0.220	*0.662*	0.087	-0.048	-0.078	0.078	0.258	0.042
Bifacial Scraper	0.360	0.268	0.184	0.275	0.193	0.220	*0.576*	0.008	0.092	0.123	0.177	0.084	-0.017
All Perforators	*0.587*	0.340	-0.003	0.144	0.083	0.008	0.180	0.075	-0.021	0.154	-0.009	-0.087	0.000
Adz	0.292	0.094	0.187	-0.020	0.145	0.143	0.069	0.341	0.318	0.259	-0.176	-0.094	0.128
Unhafted Cutting Tool	0.250	0.299	0.212	0.003	0.221	0.070	0.009	0.159	0.227	*0.539*	0.040	-0.007	0.096
Lanceolate Preform	0.145	0.005	*0.760*	0.065	0.105	-0.107	0.214	-0.027	0.088	0.019	-0.031	0.164	-0.068
Barrel Preform	0.254	0.109	0.016	*0.841*	-0.012	-0.047	-0.042	-0.026	0.058	0.037	-0.017	-0.020	0.008
Smith Preform	-0.109	0.085	-0.027	0.006	-0.060	-0.160	0.027	*0.661*	0.047	-0.013	-0.009	0.111	-0.180
Hematite	0.408	0.052	0.384	-0.082	0.105	0.270	0.286	0.108	0.403	0.212	0.055	-0.126	0.039
Axes	0.198	0.090	-0.025	-0.093	0.016	-0.105	0.031	-0.025	-0.022	0.044	*0.791*	0.059	-0.092
Ground Stone, Factor 1	*0.748*	0.081	0.184	0.193	-0.099	0.141	0.066	0.047	0.082	0.136	0.158	0.168	0.079
Ground Stone, Factor 2	0.354	*0.515*	-0.013	0.075	0.244	-0.073	0.201	0.071	0.019	0.047	0.078	0.223	-0.087
Ground Stone, Factor 3	*0.558*	0.040	0.189	0.215	0.153	0.051	-0.144	-0.196	0.053	0.072	0.124	0.140	-0.331
Ground Stone, Factor 4	0.091	0.050	*0.504*	0.021	-0.160	0.060	0.403	0.026	0.311	0.010	0.126	0.039	0.280

Archaic horizons 5-7.

Similarly, Factor 3 has high scores only in horizons 6-8 and positive moderate or high loadings on three variables; laterally ground finely flaked rectanguloid preform fragments, lanceolate preforms, and ground stone Factor 4 (hematite processing). Biface platform preparation through grinding would be facilitated by the combination of ground stone abraders used in hematite processing, and I interpret this factor as representing areas of both hematite pigment processing and final manufacture of lanceolate preforms and points.

Factor 11 has high scores only in the Middle Archaic horizons 5, 6 and a single high loading on the variable axes, and is interpreted as representing primary wood working.

TEMPORALLY NONRESTRICTIVE FACTORS

Factors representing activity that reoccurs through time include the remaining 10 factors. Three of these have high positive loadings on single variables and a fourth loads highly on a combined variable pair. These include: Factor 4, finely flaked ovate and barrel shaped preforms; Factor 6, bifacially thinned but undifferentiated whole preforms; Factor 12, whole hafted cutting tools; and Factor 13, bifacially thinned rectanguloid whole preforms. With the exception of Factor 12, these are interpreted as representing either selective discard or segregation of various whole bifacial preforms for further reduction. Factor 12 may represent a similar caching of specialized cutting implements, or areas where specialized cutting or butchering activities occurred.

The remaining six factors each have multiple, positive moderate or high variable loadings, and are dichotomized between strictly lithic manufacturing areas (Factors 5, 8 and 9) and more complex manufacture-use-and tool maintenance areas (Factors 2, 7 and 10).

Of these defining lithic manufacturing areas, Factors 5 and 8 are logically related. Factor 5 has positive moderate loadings for initially roughed out whole ovate preforms, finely shaped ovate preform fragments, laterally ground bifacially thinned ovate preform fragments, and lateral ground initially roughed out undifferentiated preform fragments. Factor 8 has both laterally ground bifacially thinned whole ovate preforms and Smith point preforms, which are subrectangular or ovate in shape. I interpret Factor 5 as comprising prime ovate preform reduction areas while Factor 8 may well reflect either selective discard or caching areas for large ovate preforms.

A correspondence between Factors 4 and 8 is indicated also, as both represent either selective discard or caching of bifacially thinned or finely shaped ovate preforms.

The final manufacturing activity factor, Factor 9, has positive moderate loadings on two variables, finely shaped rectanguloid preform fragments, and whole hafted multipurpose tools. I interpret Factor 9 as representing the final phase in bifacial preforming leading to the manufacture of many of the notched points used as both projectiles and cutting tools.

I may note as well a potential functional correspondence between Factors 9 and 13, with Factor 13 representing an earlier phase in chipped stone point manufacture.

TABLE 12.6

Factor Score Ranges

Factor	Horizon 1	2	3	5	6	7	8
1	-1.81 to 0.95	-2.30 to 0.72	-1.20 to 1.19	*-1.04 to 7.51**	*-0.68 to 5.54*	*-0.84 to 2.68*	-0.75 to 0.91
2	*-1.27 to 2.55*	*-1.35 to 3.09*	*-0.91 to 2.13*	*-3.04 to 2.97*	*-2.01 to 2.95*	*-1.66 to 2.49*	*-1.55 to 2.42*
3	-1.22 to 0.54	-1.77 to 0.43	-1.52 to 1.39	-1.26 to 1.46	*-1.05 to 3.59*	*-1.04 to 7.06*	*-0.77 to 6.03*
4	*-0.49 to 2.26*	*-0.96 to 3.82*	-0.77 to 0.43	*-2.09 to 5.23*	*-2.42 to 4.53*	*-2.81 to 5.08*	*-0.68 to 4.24*
5	-0.80 to 1.57	*-1.32 to 5.48*	-0.84 to 1.66	*-2.97 to 7.32*	*-2.61 to 6.60*	*-2.43 to 4.36*	-1.29 to 2.22
6	*-1.45 to 3.04*	-1.70 to 1.76	*-1.62 to 2.99*	*-1.79 to 5.71*	*-1.40 to 5.34*	-1.41 to 2.37	-1.27 to 2.20
7	*-1.75 to 3.15*	-2.10 to 1.35	*-1.07 to 3.21*	*-1.74 to 3.41*	*-1.48 to 7.13*	*-0.85 to 4.64*	-2.33 to 2.24
8	-2.26 to 1.82	*-1.67 to 6.43*	*-1.41 to 7.46*	*-2.24 to 4.77*	*-2.44 to 4.41*	-2.43 to 1.80	-1.07 to 1.82
9	*-1.21 to 7.17*	-2.47 to 2.75	-1.14 to 2.06	*-2.07 to 3.57*	-2.17 to 1.55	*-0.51 to 8.61*	-2.10 to 1.73
10	*-0.81 to 4.19*	*-0.57 to 5.17*	-2.20 to 0.87	*-1.45 to 2.88*	-2.13 to 1.94	*-2.21 to 5.00*	-1.40 to 2.08
11	-1.83 to 1.33	-1.94 to 1.12	-1.97 to 2.30	*-2.29 to 8.57*	*-2.42 to 5.01*	-2.64 to 1.62	-1.52 to 0.61
12	-1.44 to 1.68	*-0.82 to 3.07*	*-1.38 to 4.24*	-3.95 to 1.84	*-1.41 to 5.56*	*-4.31 to 4.21*	-2.11 to 1.34
13	-1.86 to 2.37	*-1.59 to 4.48*	*-1.68 to 4.35*	*-1.43 to 3.13*	-3.45 to 2.01	*-3.44 to 6.53*	-1.39 to 2.19

* Scores in *italics* indicate mapped factor

Before considering the more complex activities represented by Factors 2, 7, and 10, it may be useful to speculate on the contrasts and similarities among the lithic reduction factors. First, there appears to be a basic differentiation between ovate and rectanguloid preform manufacturing areas as well as selective segregation of certain nearly finished, or at least bifacially thinned, whole preforms. Second, it is possible to directly link the rectanguloid preforms to notched point manufacture; other evidence in support of this assessment is presented in Chapter 10. A similar relationship between the ovate preforms and some of the larger notched points, such as Smith, is also indicated. But it would seem as likely that many of the ovate preforms were fashioned into either finely shaped rectanguloid preforms and then into notched points or were transformed into some of the unnotched bifacial implements such as adzes or "unhafted" cutting tools. In terms of activity area definition, we might speculate that if these represent "contemporaneous" lithic reduction activities, we should see non-overlapping areas of prime bifacial preforming with peripheral areas having "cached" whole preforms.

The remaining three factors, Factors 2, 7, and 10, are not as easily interpreted as single activities. Rather, they appear to reflect either a combination of lithic manufacture, tool use and maintenance or, possibly, singular tool use areas. Factors 2 and 10 are example of the former, Factor 7, the latter.

Factor 2 has positive moderate loadings on three variables, bifacially thinned rectanguloid preform fragments, initially roughed out undifferentiated preform fragments, and ground stone Factor 2 (food processing). I interpret Factor 2 as basic domestic areas encompassing food processing and bifacial reduction of selected rectanguloid preforms.

Factor 7 has positive moderate loadings on three variables, finely shaped whole rectanguloid preforms, hafted and other bifacial scrapers, and is interpreted as maintenance activity areas involving minimally scraping of hides or vegetal materials.

Factor 10 has positive moderate loadings on four variables, bifacially thinned undifferentiated preform fragments, finely shaped undifferentiated preform fragments, whole projectile points and "unhafted" cutting tools. I interpret this factor as a manufacture-use-maintenance area for projectiles and other cutting tools.

SUMMARY COMMENTS

Factor analysis demonstrates that reduced sets of techno-functional categories, or variables, describe a number of potential "activity areas" at Rodgers Shelter. Because the data are aggregates from small excavation units, it is believed that most factors represent primary refuse or materials items left at the place where used. Three of these (Factors 1, 3 and 11) are wholely indicative of activities or activity combinations of the Early and Middle Archaic; and consist of prime domestic areas where food preparation, pigment processing, chipped stone tool manufacture and maintenance as well as other areas where lanceolate manufacture or wood working were conducted. The vast majority of the factors, however, express activities that crosscut temporal subdivisions and include: bifacial tool reduction; caching of whole preforms; lithic reduction and domestic activity sets; and, lastly, specialized cutting or scraping.

Table 12.7 summarizes these activity sets.

TABLE 12.7

Summary of Temporally Nonrestrictive Factors

Activity Set	Factor 2	4	5	6	7	8	9	10	12	13
Bifacial Reduction										
a) Ovate preforms			X							
b) Rectanguloid preforms							X			
Preform Caching										
a) Undifferentiated				X						
b) Ovate		X				X				
c) Rectanguloid										X
Lithic Reduction and Domestic	X							X		
Specialized Cutting or Scraping					X					

I do not maintain that these are the sum total of either activity sets or areas for Rodgers Shelter. Rather, these are a knowable subpopulation of potential activity areas that reflect patterns not immediately obvious in the excavation but which are nevertheless easily charted.

MAPPING SITE ACTIVITY

Factor scores, direct measures of a factor's importance, can be plotted by horizon for individual grid squares and are the key to differentiating activity in both time and space. On the maps that follow, the more densely shaded areas are interpretable as concentrated zones of activity, or more-or-less discrete activity areas. The mapped factor score ranges are the same for each of the 13 factors and all horizons. So it should be possible to intuitively compare each horizon with one another or, for a single horizon, to judge the geographic relationships of one factor to another.

Linear regressions comparing factor pairs have also been computed for individual horizons (Table 12.8). Although there are a few that have statistically significant correlations, none of the factor pairs express strong linear relationships; it is suggested by inspection of several of the maps that correlations among factors are largely curvilinear. That is, certain factors may well express temporally correlated but spatially segregated activities. This appears to be the case for many of the lithic reduction and preform "caching" factors.

For the horizons considered (Table 12.6), there are between three and eleven factors for which maps were made. The following discussion deals with these individually by horizon, beginning with Horizon 8 and ending with Horizon 1.

HORIZON 8: THE EARLY ARCHAIC, 8600-8100 B.P.

Four centers of activity are defined for Horizon 8 (Figs. 12.4 and 12.5). Beneath the overhang a single area was used for domestic activi-

TABLE 12.8

Linear Regressions of Factor Scores

Horizon	Factors Y-Axis	Factors X-Axis	Plotted Values	r	r^2	p	s	Intercept (A)	Slope (B)
1	2	4	41	-0.048	0.002	0.762	0.668	0.075	-0.046
	2	9	41	0.455	0.207	0.002	0.596	0.029	0.214
	2	10	41	-0.141	0.020	0.376	0.662	0.115	-0.075
	4	5	41	-0.102	0.010	0.525	0.698	0.078	-0.110
2	4	5	40	-0.061	0.003	0.706	0.843	0.059	-0.043
	4	8	40	0.087	0.007	0.592	0.841	0.033	0.050
	2	4	40	0.321	0.103	0.043	1.688	0.813	0.677
	2	5	40	0.080	0.006	0.623	1.777	0.839	0.119
	2	8	40	-0.010	0.000	0.950	1.783	0.856	-0.012
	2	10	40	0.164	0.027	0.309	1.758	0.679	0.211
	2	12	40	0.264	0.070	0.098	1.719	0.830	0.500
	2	13	40	-0.179	0.032	0.267	1.754	0.895	-0.266
3	2	8	43	-0.013	0.000	0.931	0.639	-0.086	-0.005
	2	12	43	0.075	0.005	0.628	0.637	-0.111	0.037
	2	13	43	0.123	0.015	0.428	0.634	-0.100	0.065
5	1	2	42	-0.059	0.003	0.708	1.723	0.820	-0.080
	1	4	42	-0.083	0.006	0.600	1.720	0.851	-0.085
	1	5	42	-0.175	0.030	0.265	1.699	0.846	-0.173
	1	6	42	0.079	0.006	0.618	1.721	0.776	0.089
	1	8	42	0.473	0.224	0.001	1.520	0.771	0.755
	1	11	42	-0.262	0.068	0.093	1.666	0.908	-0.282
	4	5	42	0.214	0.045	0.172	1.646	0.194	0.206
	4	8	42	-0.056	0.003	0.721	1.683	0.217	-0.088
6	1	2	42	0.454	0.206	0.002	1.409	0.556	0.715
	1	3	42	-0.037	0.001	0.814	1.581	0.589	-0.052
	1	4	42	0.147	0.021	0.352	1.565	0.537	0.141
	1	5	42	0.222	0.049	0.156	1.543	0.540	0.247
	1	6	42	-0.357	0.127	0.020	1.478	0.647	-0.344
	1	7	42	-0.038	0.001	0.808	1.581	0.592	-0.042
	1	8	42	-0.318	0.101	0.040	1.500	0.578	-0.488
	1	11	42	0.198	0.039	0.206	1.551	0.487	0.189
	1	12	42	-0.001	0.000	0.993	1.582	0.586	-0.001
	2	3	42	-0.163	0.026	0.301	0.992	0.049	-0.145
	4	5	42	-0.195	0.038	0.214	1.611	0.386	-0.226
	4	8	42	-0.076	0.005	0.628	1.638	0.343	-0.122
7	1	2	40	0.457	0.208	0.003	0.726	0.219	0.445
	1	3	40	0.151	0.022	0.352	0.806	0.135	0.066
	1	4	40	-0.246	0.060	0.124	0.791	0.158	-0.179
	1	5	40	0.226	0.051	0.159	0.795	0.172	0.163
	1	7	40	0.120	0.014	0.457	0.810	0.138	0.059
	1	9	40	0.412	0.169	0.008	0.743	0.797	0.215
	1	10	40	0.129	0.016	0.425	0.809	0.180	0.087
	1	12	40	-0.109	0.011	0.503	0.811	0.184	-0.068
	1	13	40	0.087	0.007	0.590	0.813	0.173	0.044
	2	3	40	0.217	0.047	0.177	0.816	-0.158	0.098
	9	7	40	0.292	0.085	0.066	1.496	0.274	0.277
	9	10	40	0.133	0.017	0.412	1.550	0.450	0.172
	9	12	40	-0.273	0.074	0.088	1.505	0.486	-0.328
	4	5	40	-0.111	0.012	0.495	1.115	-0.083	-0.110
8	2	3	36	0.722	0.521	0.000	0.611	-0.257	0.389
	2	4	36	-0.192	0.036	0.261	0.867	-0.067	-0.215
	4	5	36	-0.074	0.005	0.666	0.786	-0.042	-0.099

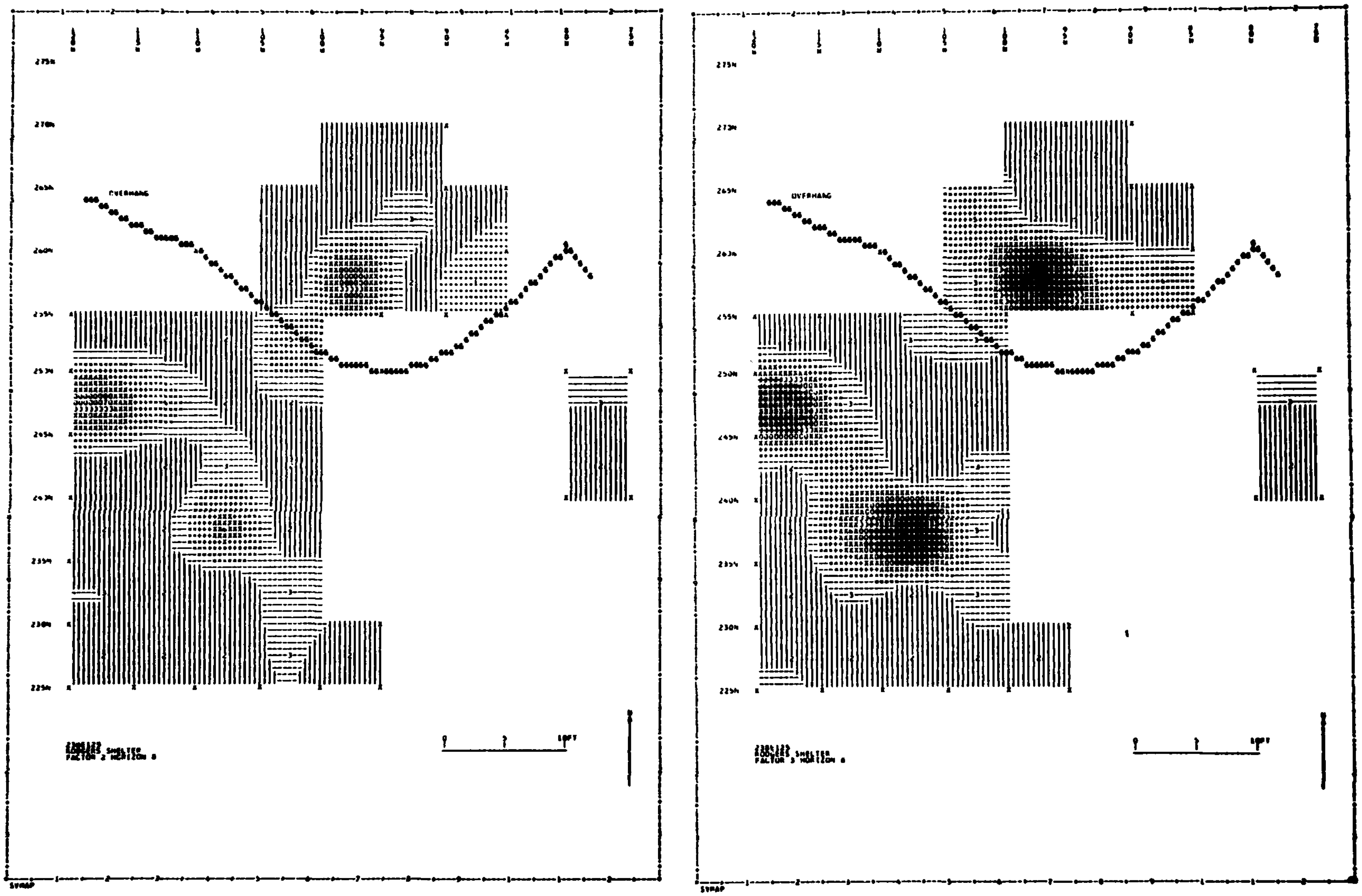

Figure 12.4. Early Archaic domestic and lithic reduction areas (Horizon 8, Factor 2); Early Archaic hematite processing and lanceolate point manufacture areas (Horizon 8, Factor 3).

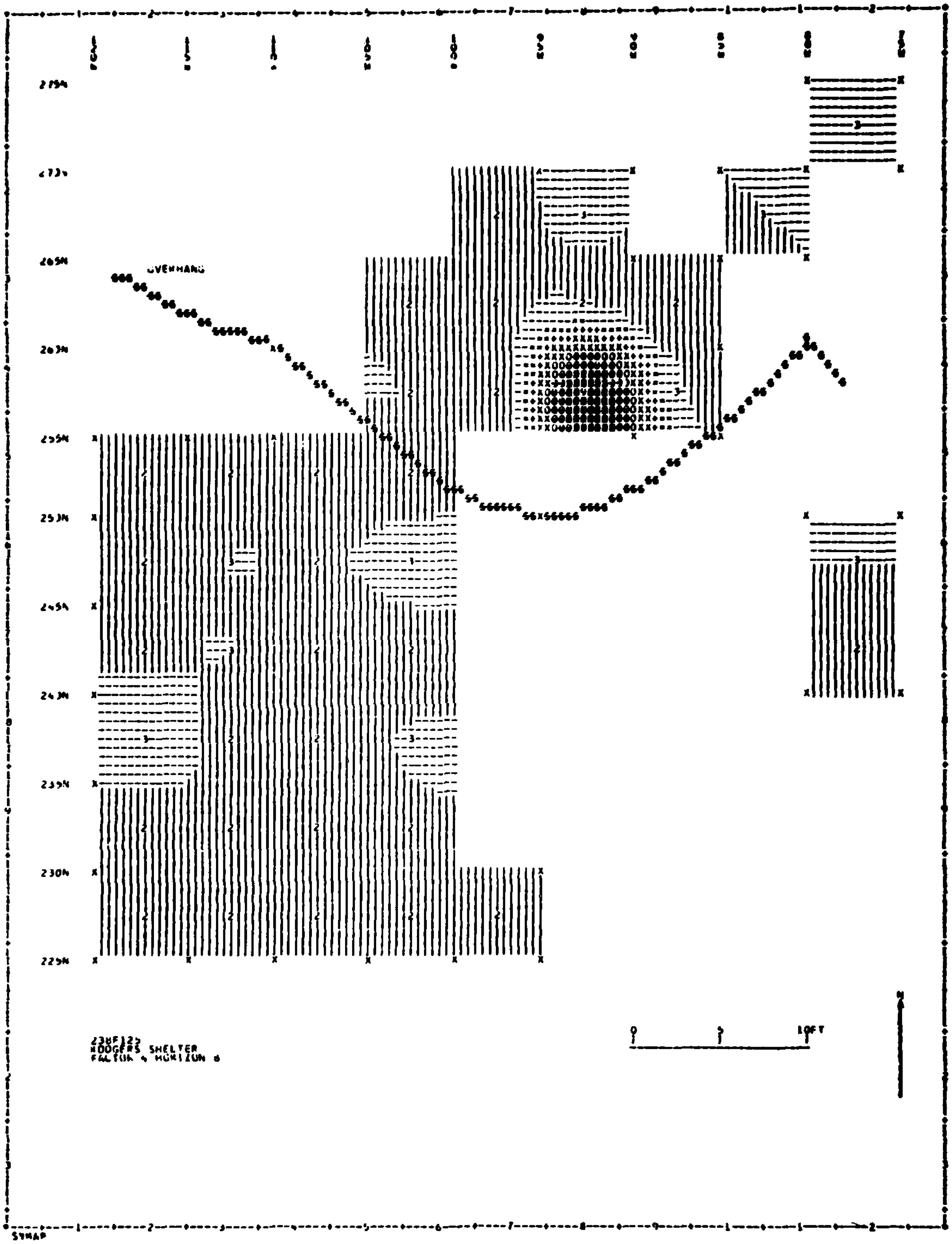

Figure 12.5. Early Archaic finely shaped ovate preform (Horizon 8, Factor 4) area beneath the overhang. Note that this activity area is separate from those defined by Factors 2 and 3.

ties (Factor 2), pigment processing and manufacture of rectanguloid preforms and lanceolate points (Factors 2 and 3); two identical use areas are present south of the overhang also. The fourth area (Fig. 12.5) is beneath the overhang to the east of the center defined by Factors 2 and 3, and was the location of whole, finely flaked ovate preforms.

Considering that the excavation units are essentially randomly placed and provide reasonable coverage of both shelter and terrace areas, activity at Rodgers Shelter during the Early Archaic does not seem to be specifically oriented with respect to the overhang.

HORIZON 7: EARLY AND MIDDLE ARCHAIC, 8100-7500 B.P.

In contrast to Horizon 8, Horizon 7 manifests a concentrated usage of the shelter for a wide range of activities; secondary areas for most of these activities also are defined on the terrace south of the overhang. Overlapping shelter activities include Factor 3, hematite processing and lanceolate point manufacture (Fig. 12.6), with domestic areas identified by Factors 1 (Fig. 12.6) and 2 (Fig. 12.7), constituting a single prime activity area. For purposes of discussion, Factor 3 is considered as the reference area. On the peripheries of this area are discrete lithic reduction zones dealing with either ovate preforming and caching (Fig. 12.8) or caching of whole rectanguloid preforms (Fig. 12.7). Use of specialized cutting implements, defined by Factor 12, also largely circumscribes the hematite processing area (Fig. 12.9). Specialized scraping (Fig. 12.9), maintenance and use areas for projectiles and other cutting tools (Fig. 12.10), and manufacture areas for notched points (Fig. 12.10) are highly correlated and also occupy much of the space defined by Factor 3.

Considering the fact that Horizon 7 beneath the overhang is as much as 2.5 feet thick, the shelter area might be interpreted as a locus of spatially patterned but repetitive activities over a period of perhaps 600 years. Alternatively, the consistent spatial patterning could conceivably reflect intense use over a much shorter interval, on the order of magnitude of a single generation or two. My own preference is for the latter interpretation but there is no hard evidence (i.e., C^{14} dates for feature areas) to make the critical assessment.

Activities south of the overhang on the terrace have variable configurations. Factors 1, 4, and 12 comprise as many as four nuclear areas of activity, representing primary lithic reduction of ovate preforms as well as specialized bifacial tool use areas. Factor 7 scraping activity areas are adjacent also. Moreover, bifacial tool maintenance defined by Factor 10 is present in a single area which overlaps with the Factors 1, 5 and 12 group. Two notched point manufacture areas (Factor 9) near the overhang are associated with either Factor 7 or Factors 1 and 12 concentrations. Separate sets of spatially defined domestic(?) activities are individually illustrated by three Factor 3 zones and two independent Factor 2 zones. In sum, excavation south of the overhang identifies a minimum of nine discrete activity areas that reflect less intense use than was present beneath the overhang.

It is also inferred from plotting the provenience of fragments and flakes from Biface 57 (Fig. 10.32), a mended ovate preform, that certain of the terrace lithic reduction scatters are coeval with lithic reduction

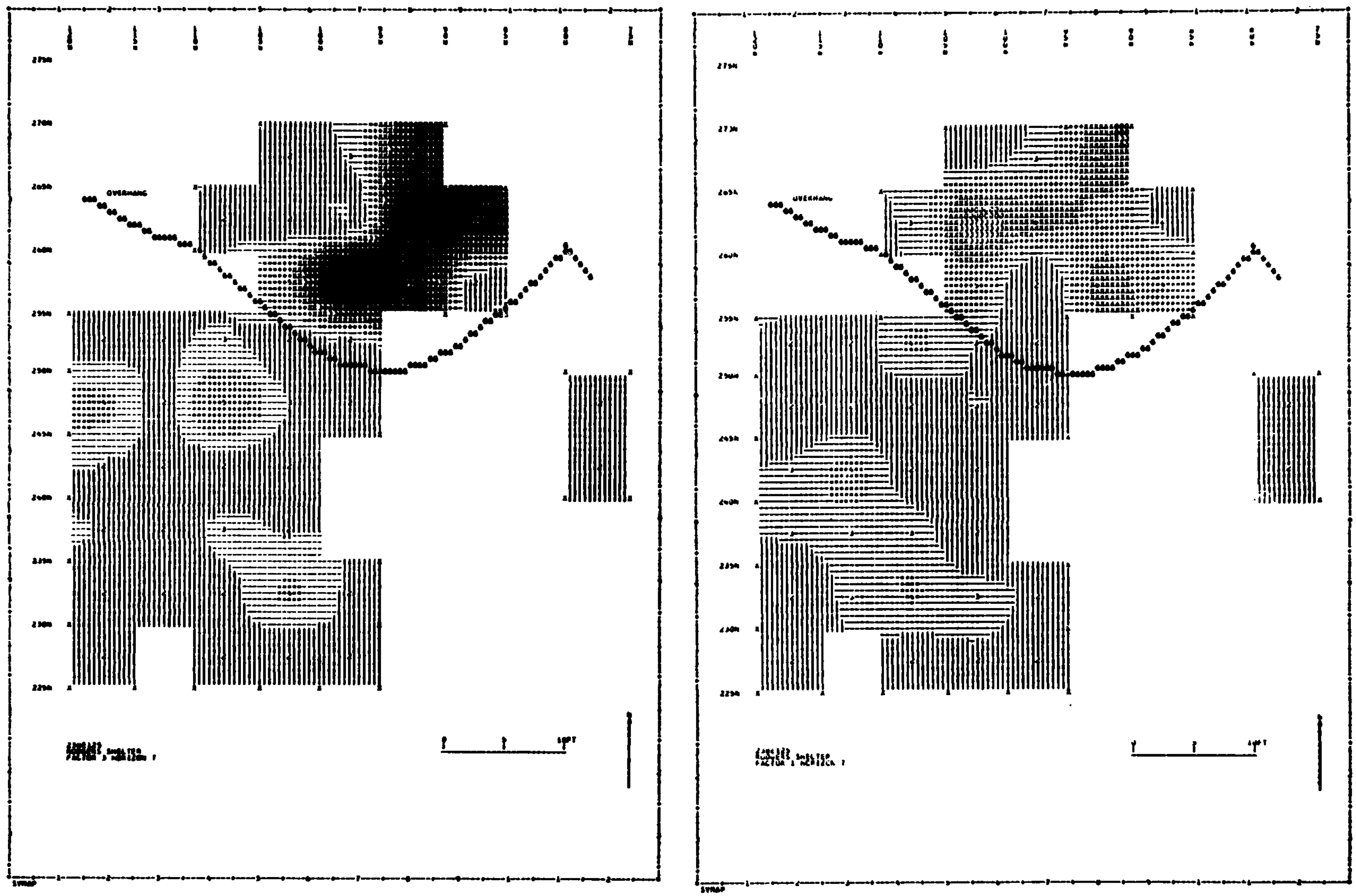

Figure 12.6. Early or Middle Archaic hematite processing and lanceolate point manufacture areas (Horizon 7, Factor 3); note predominate use of shelter as locus of this activity. This area is correlated with other domestic activities and forms the nucleus of a highly patterned set of lithic reduction and specialized tool use areas (Horizon 7, Factor 1).

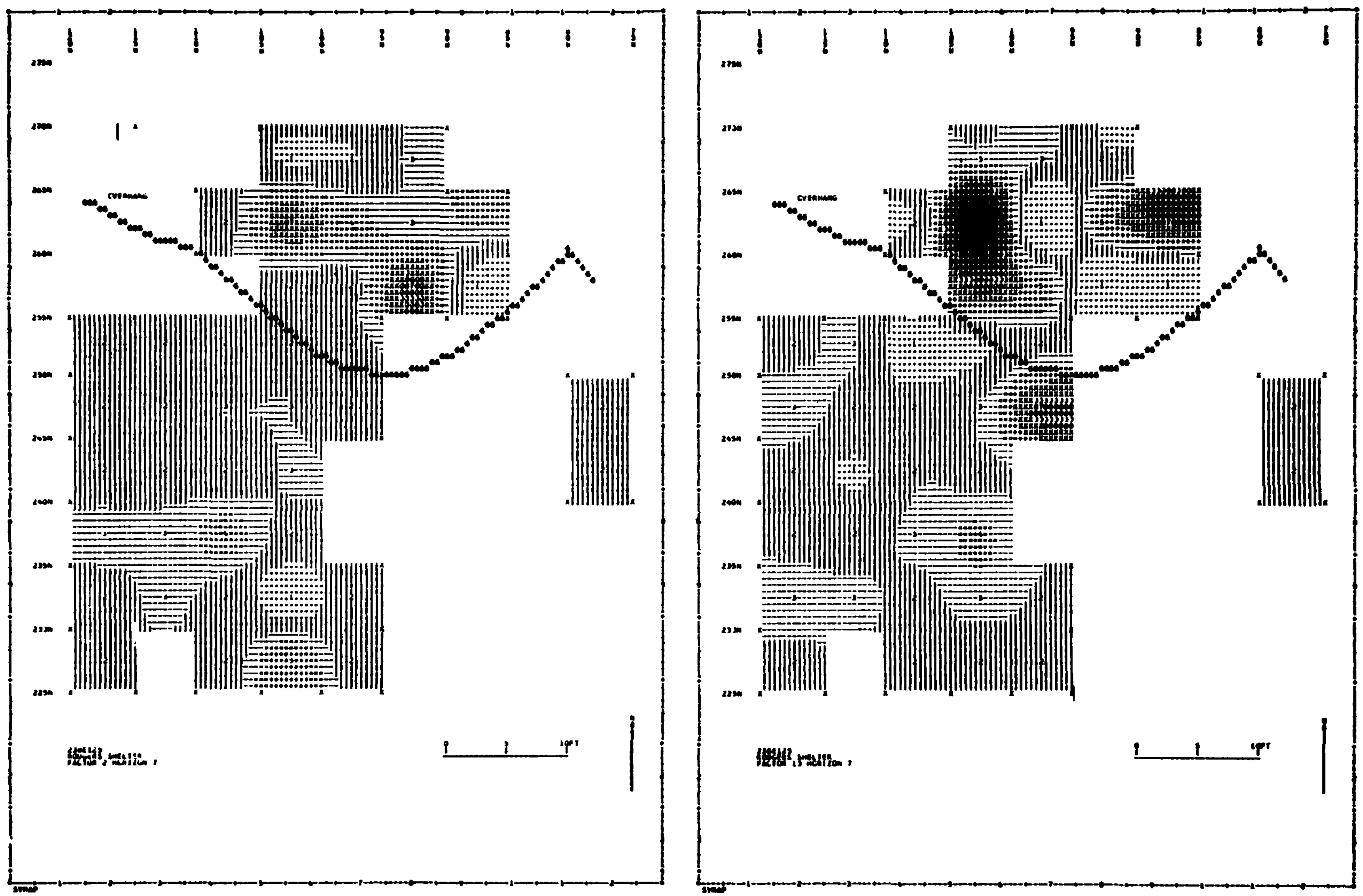

Figure 12.7. Early or Middle Archaic domestic use areas (Horizon 7, Factor 2); note correlations with Factors 1 and 3. Horizon 7, Factor 13: Early or Middle Archaic lithic reduction (rectanguloid preform) zones.

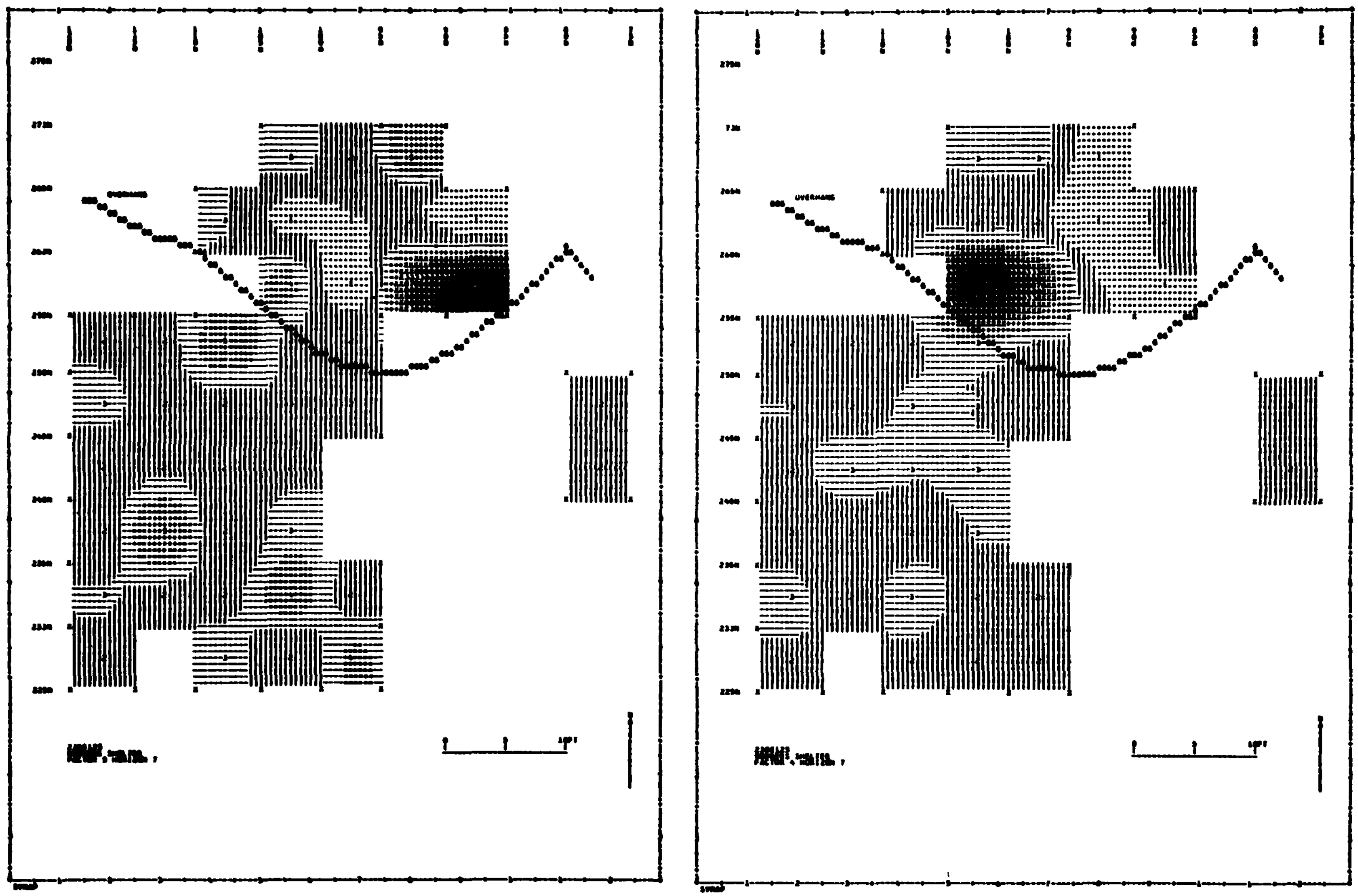

Figure 12.8. Early or Middle Archaic lithic reduction (ovate preforms) zones (Horizon 7, Factor 5). Horizon 7, Factor 4: Early or Middle Archaic ovate preform "caching" areas.

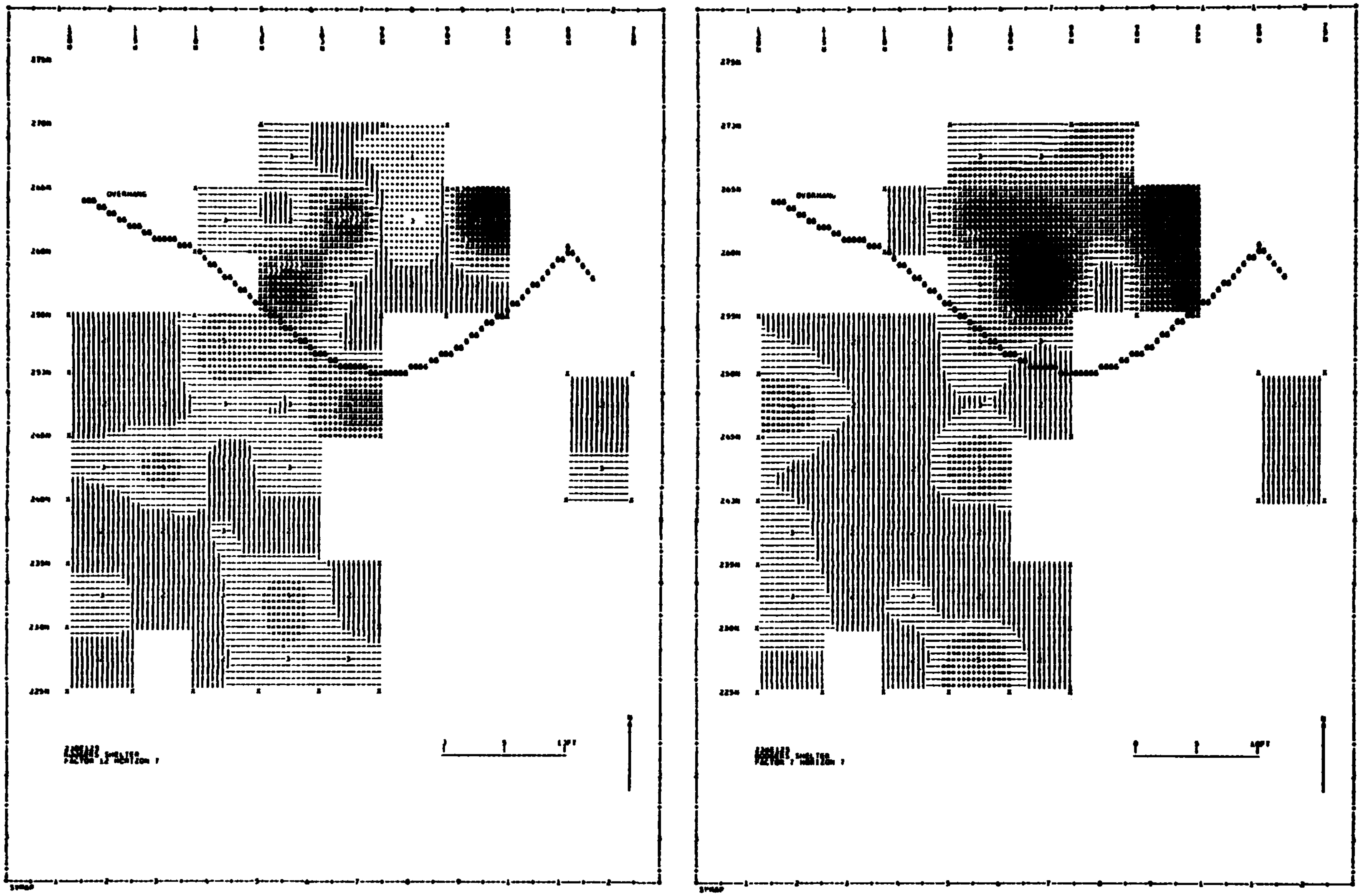

Figure 12.9. Early or Middle Archaic specialized cutting tool use zones (Horizon 7, Factor 12). Horizon 7, Factor 7: Early or Middle Archaic specialized scraping activity areas; see Figures 12.15 and 12.18.

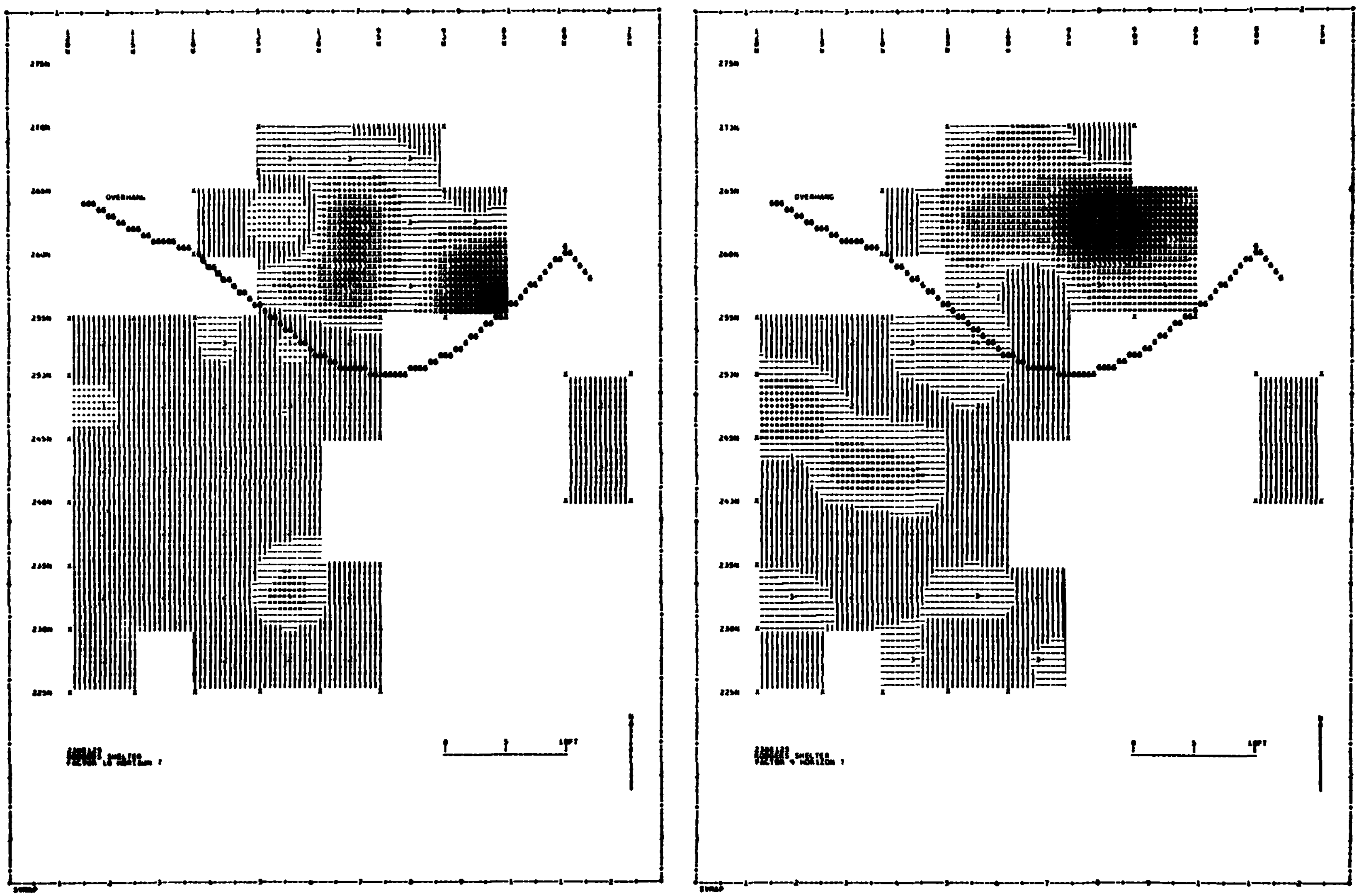

Figure 12.10. Early or Middle Archaic tool maintenance and use areas for projectiles and other cutting tools (Horizon 7, Factor 10). Horizon 7, Factor 9: Early or Middle Archaic notched point manufacturing areas.

activities beneath the overhang. Thus, what appears to have taken place is that bifacial reduction centered beneath the shelter in the areas defined and adjacent to the Factor 3 scatter. At least a small number of bifacially thinned preforms were then further shaped in front of the overhang, resulting in at least four separable lithic reduction areas. I suspect that this was short term area usage by only a few flintknappers, perhaps no more than one or two individuals.

Lastly, because the distribution of excavated grid squares is essentially random and adequately covers shelter and terrace areas, I interpret the clustering of identified activity areas beneath the overhang as an accurate assessment of dichotomous site usage of space; the overhang was the prime focus of site activities.

Similar confidence in evaluating a potential shelter/terrace dichotomy in activities is not possible for the younger horizons, all of which have non-randomly placed excavated squares. Nevertheless, because much of the shelter was excavated in the upper horizons, it may be reasonable to attempt to assess this potential dichotomy for the upper horizons as well.

HORIZON 6: MIDDLE ARCHAIC, 7500-6700 B.P.

Assuming that the excavation does to a reliable degree reflect spatial patterning, then Horizon 6 documents a basic change in the orientation of site activities. "Domestic" use areas (Fig. 12.11) embodying food preparation, minimal grinding of hematite for powder, use and maintenance of various chipped stone tools and bifacial reduction of primarily rectanguloid preforms cover large areas on the terrace south of the overhang and do not occur beneath the shelter. Other (Factor 3) hematite processing combined with lanceolate point manufacture, however, is represented by a shelter area (Fig. 12.12) but is also closely associated with the domestic area to its front identified by Factors 1 and 2.

Bifacial reduction of ovate preforms (Fig. 12.12) circumscribes the primary domestic area, as do cached or discard areas for bifacially thinned ovate preforms (Fig. 12.13). Nearly complete or finely finished ovate preforms (Fig. 12.13) occur within the Factor 1 domestic areas as well as within an adjacent zone to the south. This may show that as these ovate preforms are reduced they are consciously sorted; those selected for further working are "recycled" through the prime domestic area where final biface manufacture and tool maintenance activities were conducted. This basic view of selective sorting of preforms is supported by the peripheral distributions of undifferentiated whole preforms (Fig. 12.14).

Specialized use areas such as scraping (Fig. 12.14), wood working (Fig. 12.15) and butchering (Fig. 12.15) are largely peripheral to the main domestic area, and secondary activity areas are beneath the shelter as well.

HORIZON 5: MIDDLE ARCHAIC, 6700-6300(?) B.P.

Horizon 5 appears to express continuity in activity placement with Horizon 6, particularly in the location of Factor 5 ovate preform reduction. The primary "domestic" area identified by Factor 1 (Fig. 12.16) shifts to the north and is adjacent to the overhang. Peripheral activities associated with this domestic scatter include closely aligned zones of

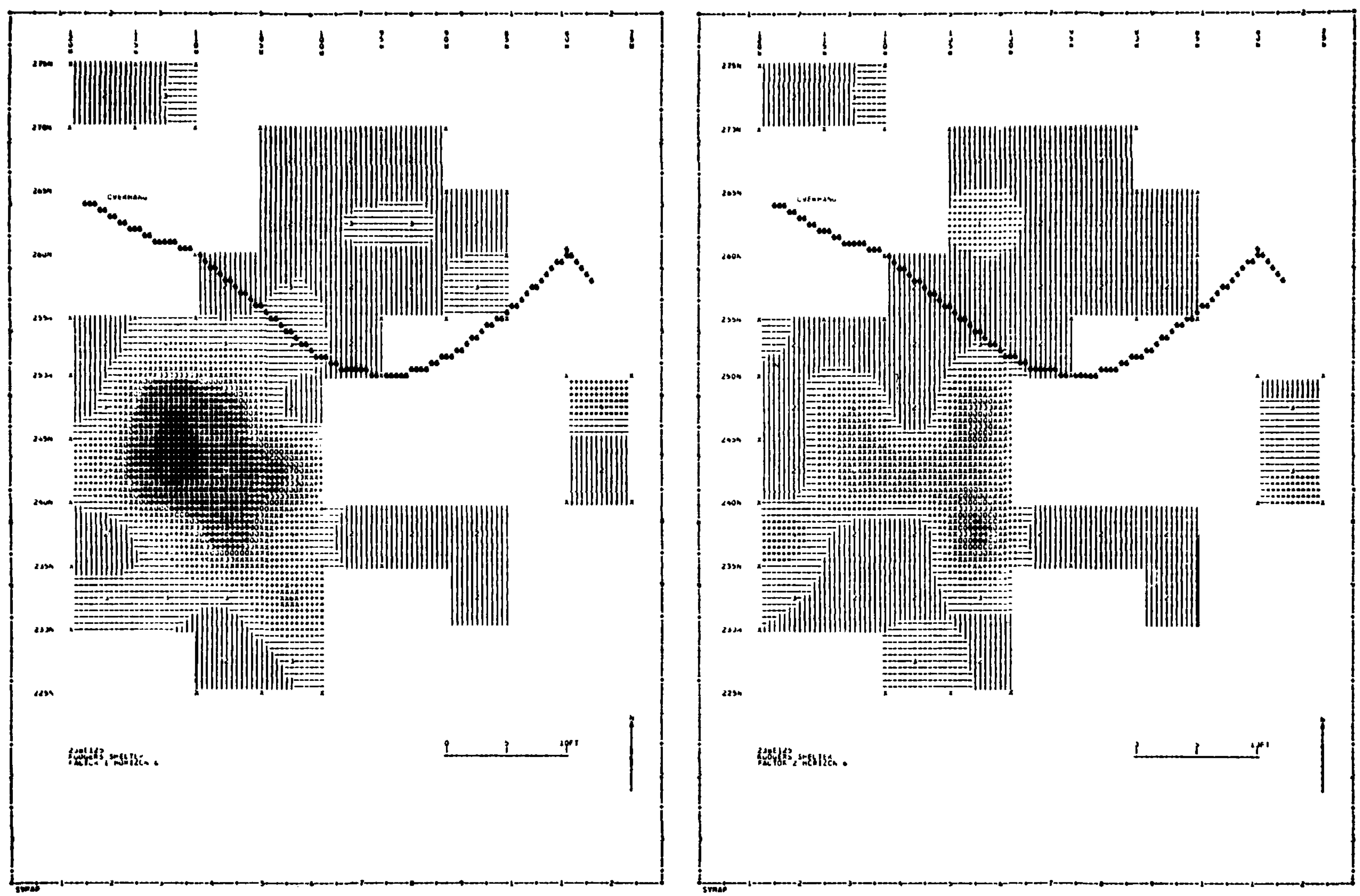

Figure 12.11. Horizon 6, Middle Archaic major domestic activity areas (Factor 1); the dense area south of the overhang was location of food and hematite processing as well as bifacial reduction, tool use and maintenance. Horizon 6, Factor 2: Middle Archaic food processing and lithic reduction (rectanguloid preforms) area; note complimentary relationships with Factor 1.

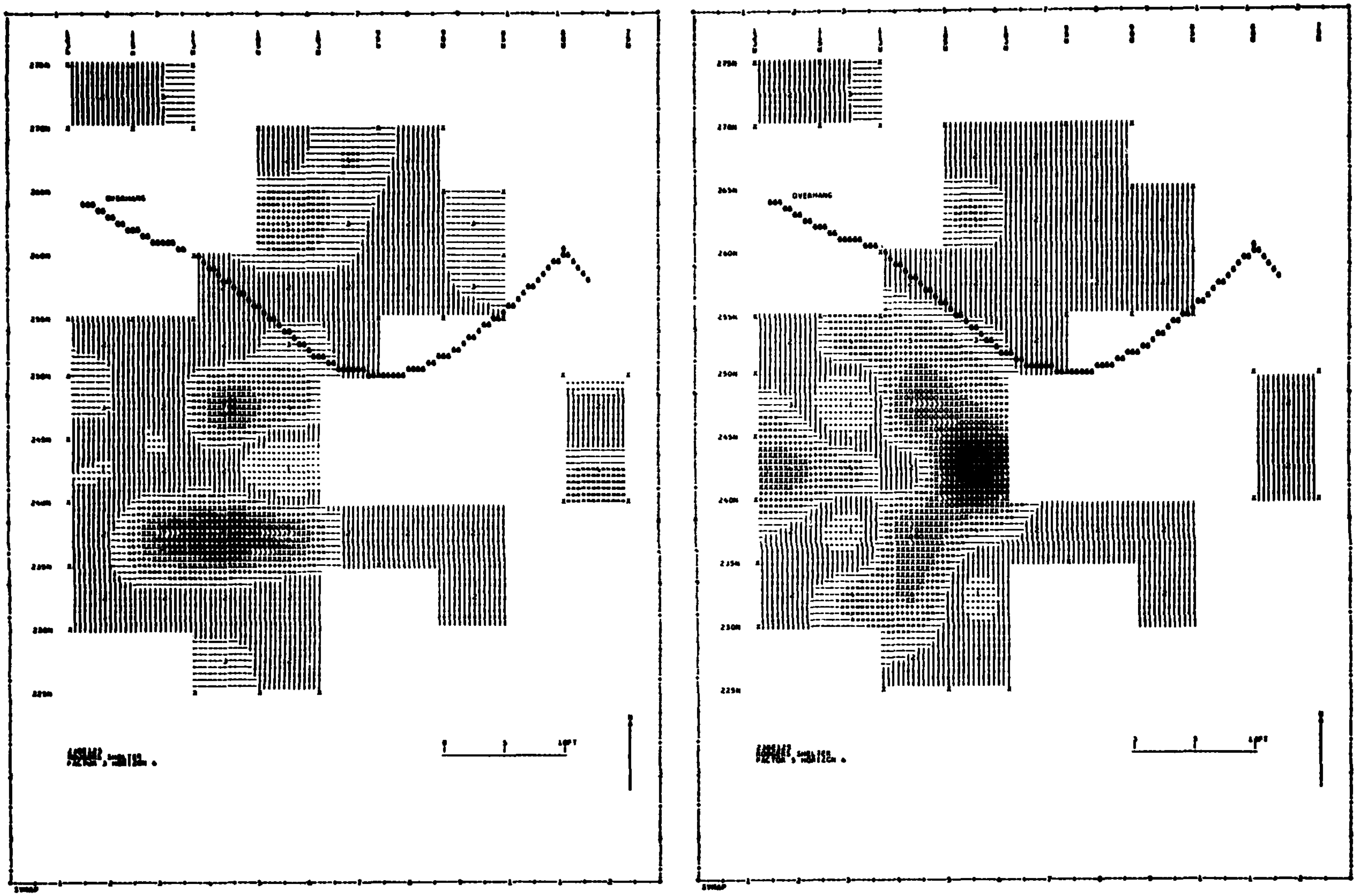

Figure 12.12. Middle Archaic Factor 3 (Horizon 6) hematite processing and lanceolate point manutacture; note that dense areas are in complimentary distribution with activity areas expressed by Factor 2, and a secondary use area is beneath the overhang also. Horizon 6, Factor 5: Middle Archaic ovate preform lithic reduction; note areas border the prime Factor 1 scatter south of the overhang.

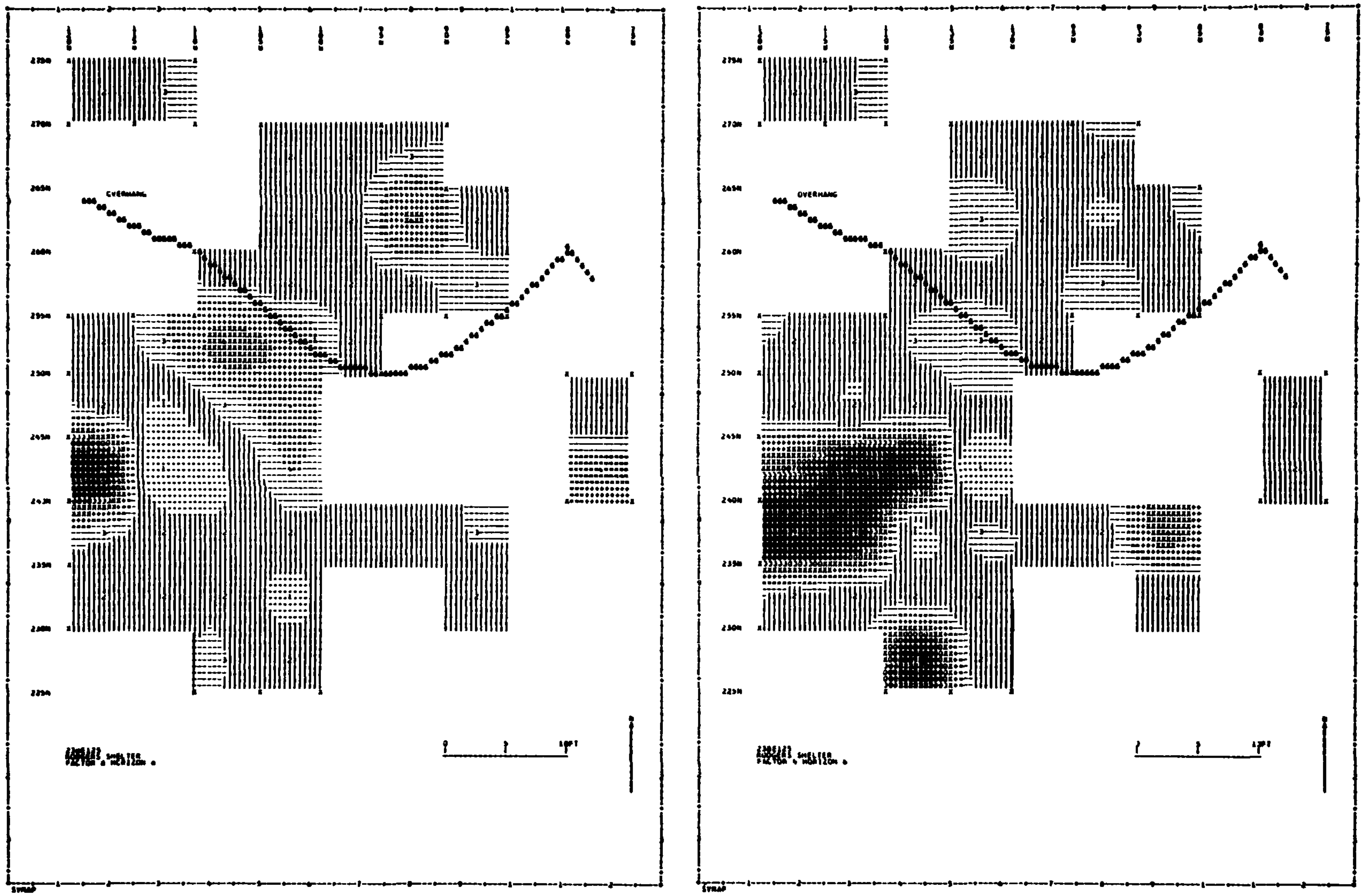

Figure 12.13. Horizon 6, Factor 8 Middle Archaic bifacially thinned whole ovate preform cache or discard zones. Horizon 6, Factor 4: Middle Archaic finely shaped whole ovate preform cache or discard zones.

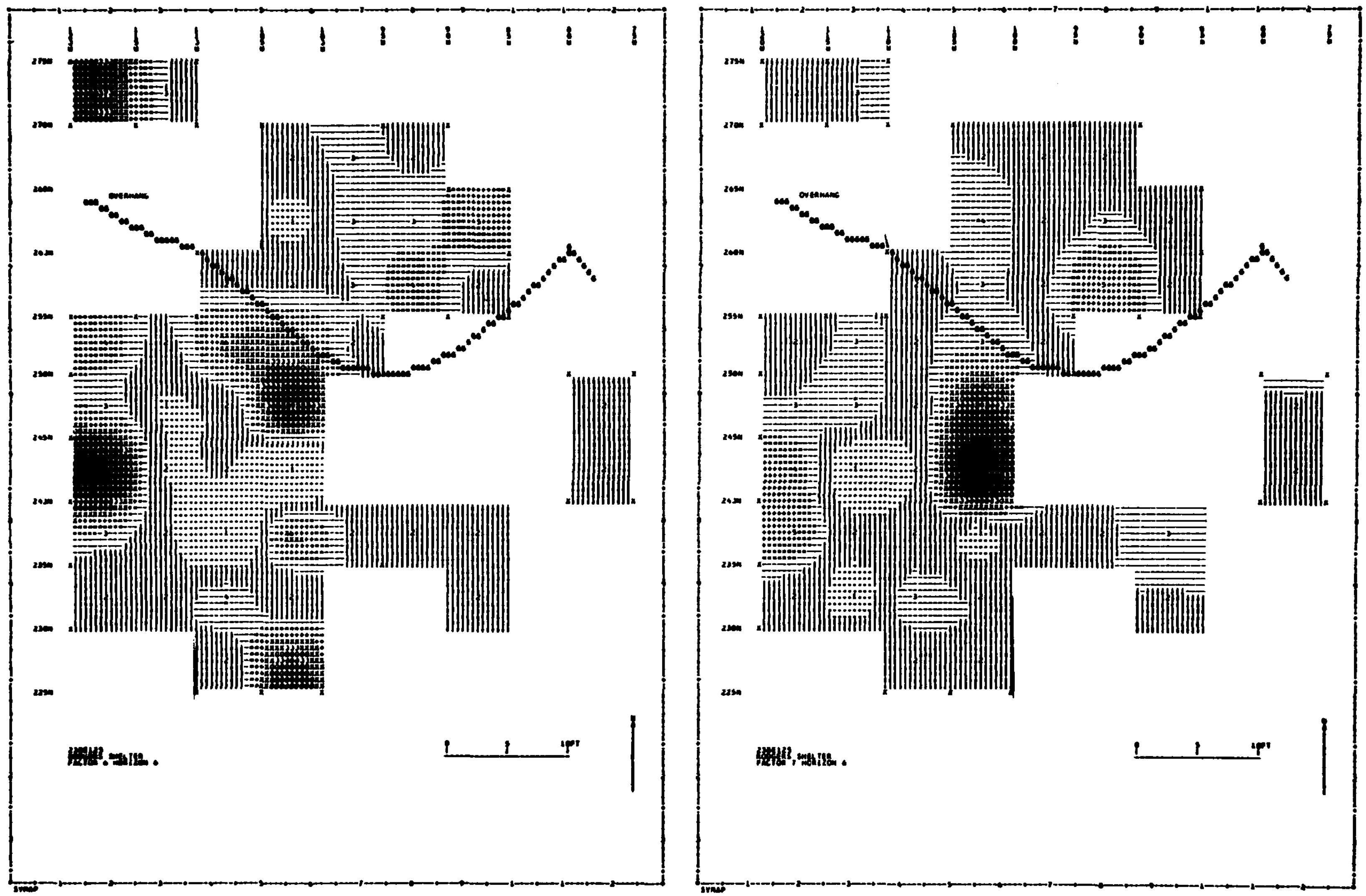

Figure 12.14. Horizon 6, Factor 6 Middle Archaic undifferentiated whole preform cache or discard zones. Horizon 6, Factor 7: scraping activity areas; note partially complimentary distribution with Factors 5 and 8.

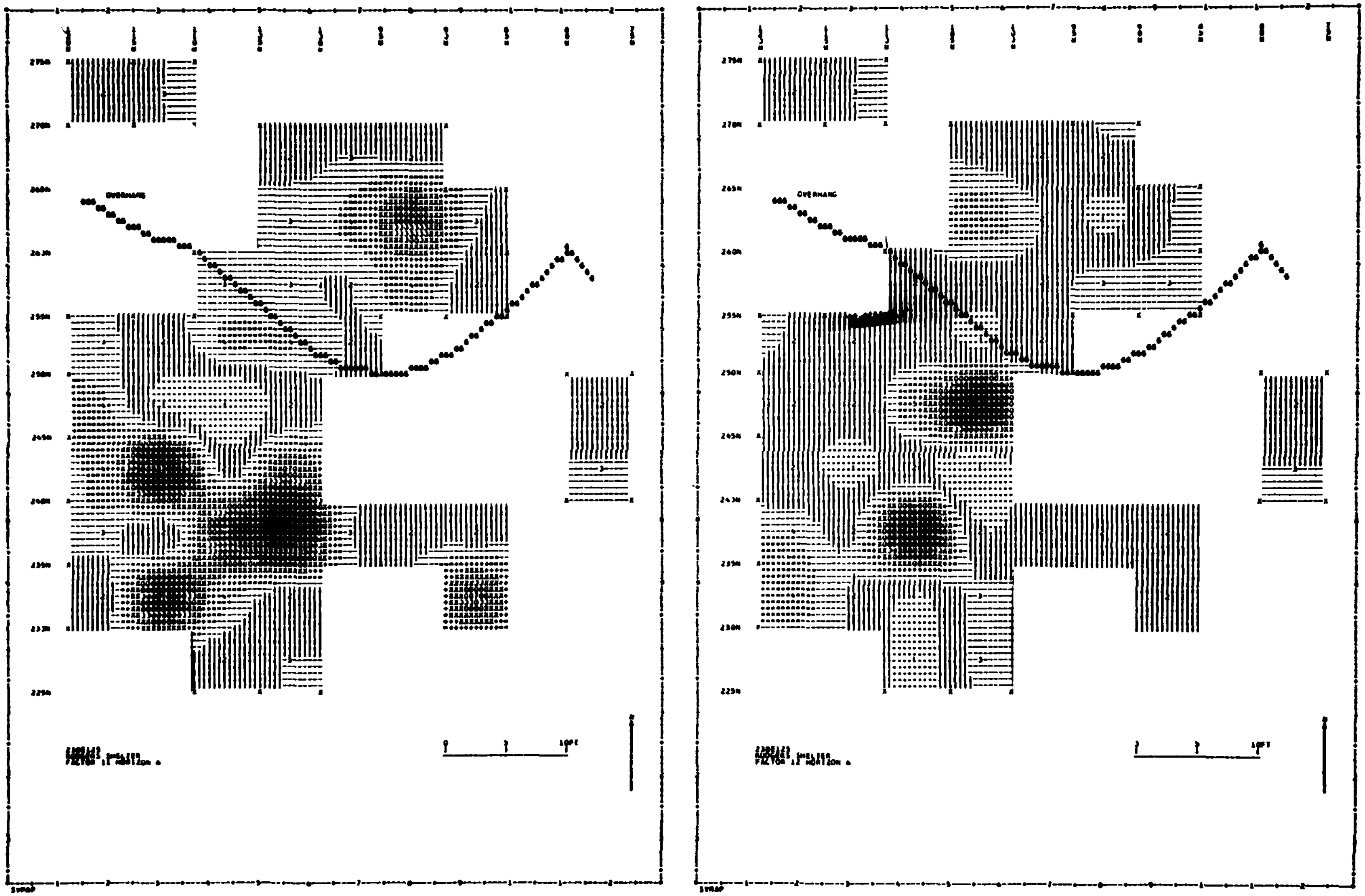

Figure 12.15. Horizon 6, Middle Archaic Factor 11 wood working areas defined by presence of axes. Horizon 6, Factor 12: Middle Archaic specialized cutting or butchering areas.

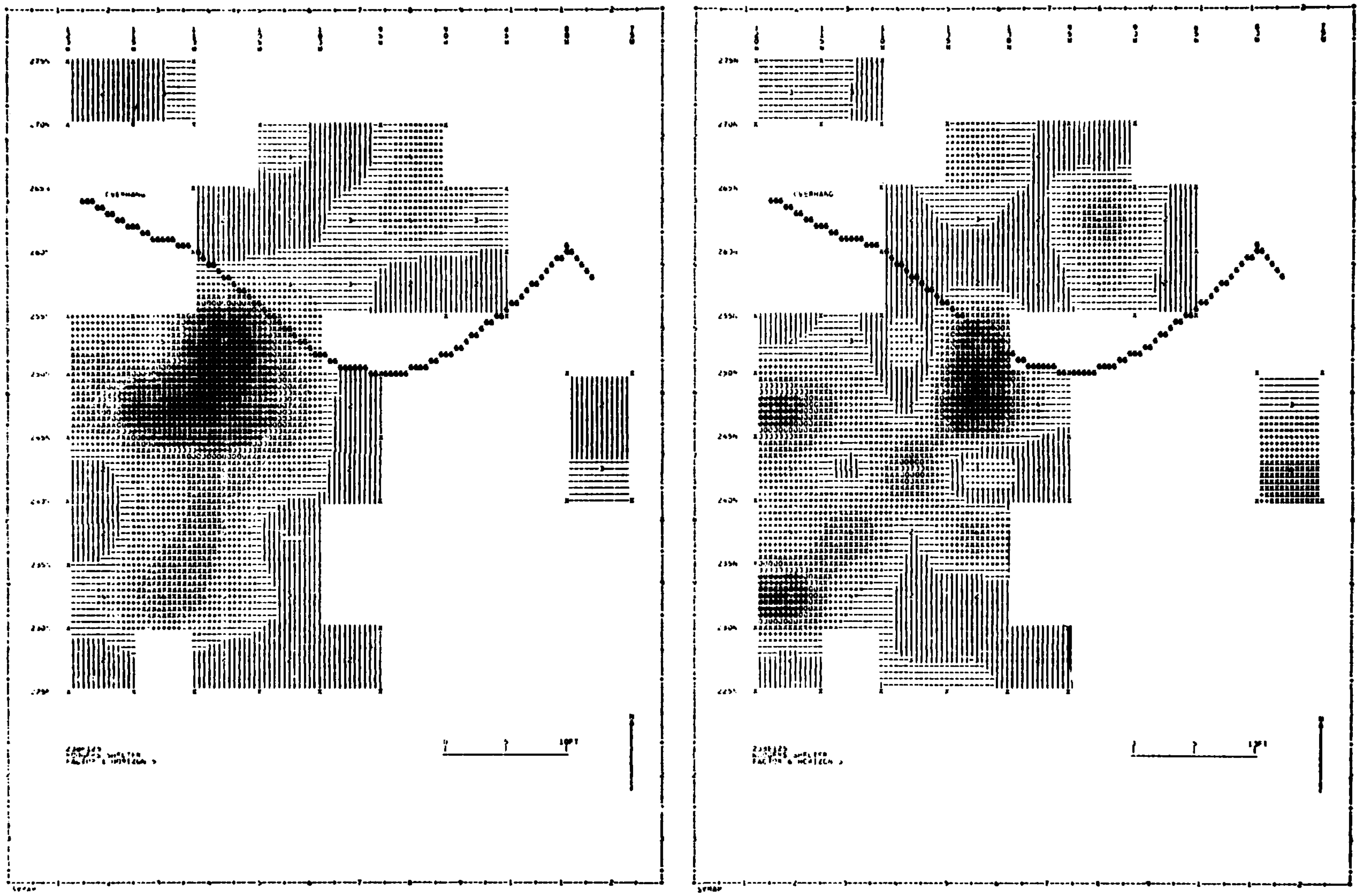

Figure 12.16. Horizon 5, Factor 1 Middle Archaic domestic activity areas. Horizon 5, Factor 6: Middle Archaic whole undifferentiated preforms.

whole undifferentiated preforms (Fig. 12.16), rectanguloid preform (Fig. 12.17) as well as ovoid preform (Fig. 12.18), reduction and cache or discard areas (Figs. 12.18 and 12.19). Specialized use areas (Fig. 12.20) also correlate with the Factor 1 area but also occur as shelter and other terrace activities.

Less concentrated domestic, lithic reduction and chipped stone tool use areas are defined also by Factors 2 and 10 (Fig. 12.21). These two factors are complementary in their configurations, dense zones beneath and south of the overhang.

HORIZON 3: LATE ARCHAIC, 3600-2500 B.P.

Initial Late Archaic use of Rodgers Shelter comprised a limited set of activities and activity areas. Domestic use areas (Fig. 12.22) are small, nuclear and occur on the terrace and beneath the overhang. Whole ovate or Smith point preforms (Fig. 12.22) are south of the overhang, while whole rectanguloid preforms are both beneath the overhang and on the terrace (Fig. 12.23), again illustrating a basic dichotomy in selective reduction of bifacial preforms. Specialized scraping activities (Fig. 12.23) correspond to both the Factor 2 domestic areas and the Factor 12 specialized cutting or butchering areas (Fig. 12.24). To be sure, the most striking activity is represented by Factor 12, and inferred butchering of game mainly occurred on the terrace south of the overhang.

HORIZON 2: LATE ARCHAIC/WOODLAND, 2500-1750 B.P.

If increased size of domestic areas with associated lithic reduction (Fig. 12.25) and biface preform cache or discard areas (Figs. 12.26 and 12.27) imply larger group size, then Horizon 2 may represent an increase in group size over Horizon 3.

Factor 2 (Fig. 12.25) illustrates a minimum of five, or possibly six large domestic areas, some of which extend beyond the limits of the excavation. The heaviest, or most pronounced domestic use areas were on the terrace just south of the overhang and occur as irregular shaped scatters. A minimum of three domestic areas were defined by shelter excavations. Primary ovate preform manufacture is associated with the large domestic scatter just beyond the overhang (Fig. 12.25). And the pattern of peripheral caching or discarding of whole ovate (Fig. 12.26), undifferentiated (Fig. 12.27) or rectanguloid (Fig. 12.27) preforms is seen again.

Potential special use areas (Fig. 12.28), as defined by Factors 10 and 7, also either overlap or occupy areas peripheral to the main Factor 2 domestic scatters. In this respect, it is interesting to note that Factor 10 maintenance and/or use areas for projectiles and other cutting tools (Fig. 12.28) are highly discrete and separate from the domestic areas and correlate with Factor 13 (Fig. 12.27) areas while scraping activity areas (Fig. 12.28) share much of the terrace space observed for Factor 2 domestic areas.

HORIZON 1: WOODLAND/MISSISSIPPIAN, 1750-1000 B.P.

The most extensive and obvious indicator of site activity areas for Horizon 1 is Factor 10, manufacture, maintenance and use of projectiles

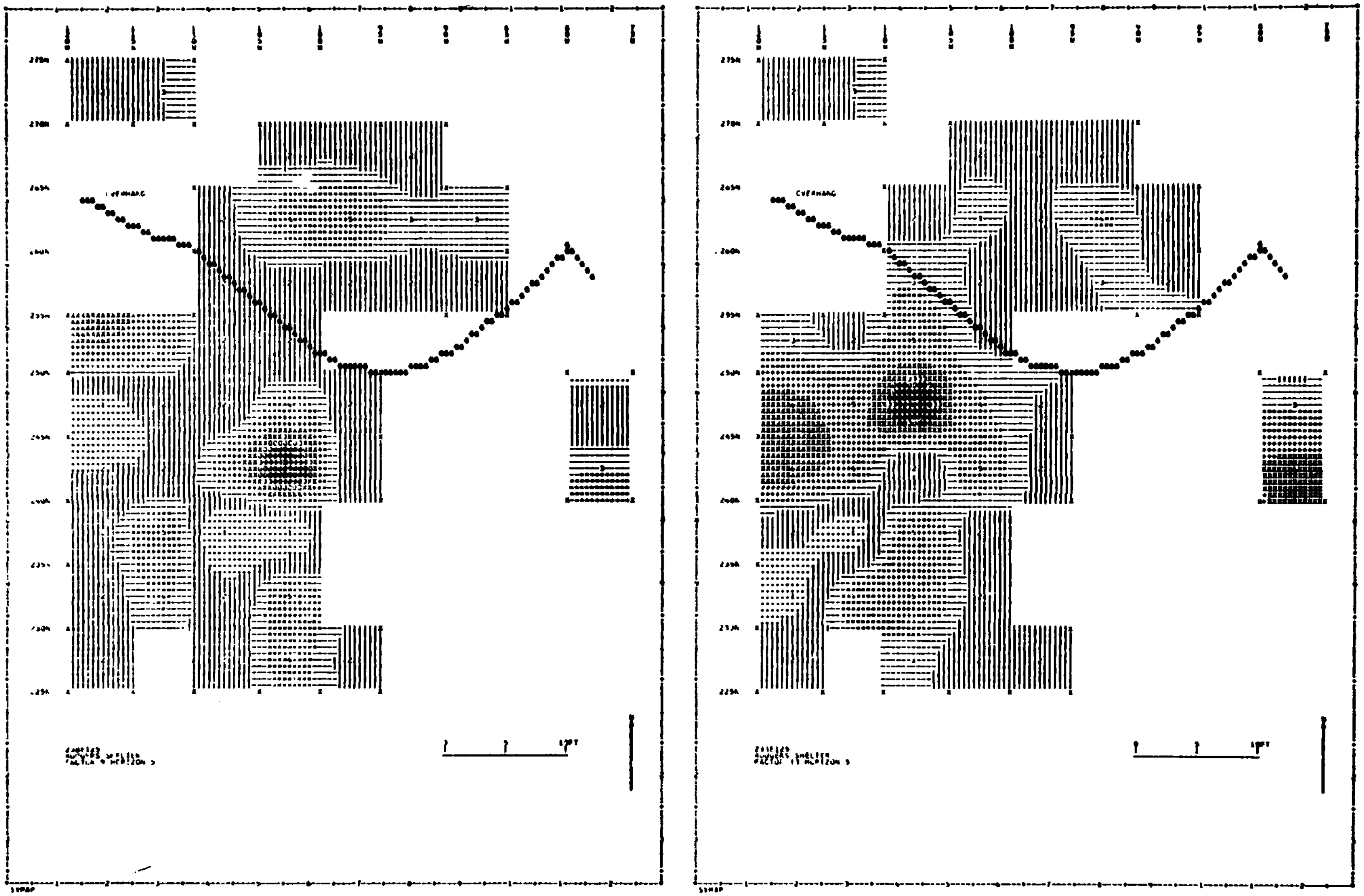

Figure 12.17. Horizon 5, Factor 9: Middle Archaic rectanguloid preform manufacture zones. Horizon 5, Factor 13: Middle Archaic whole rectanguloid preforms.

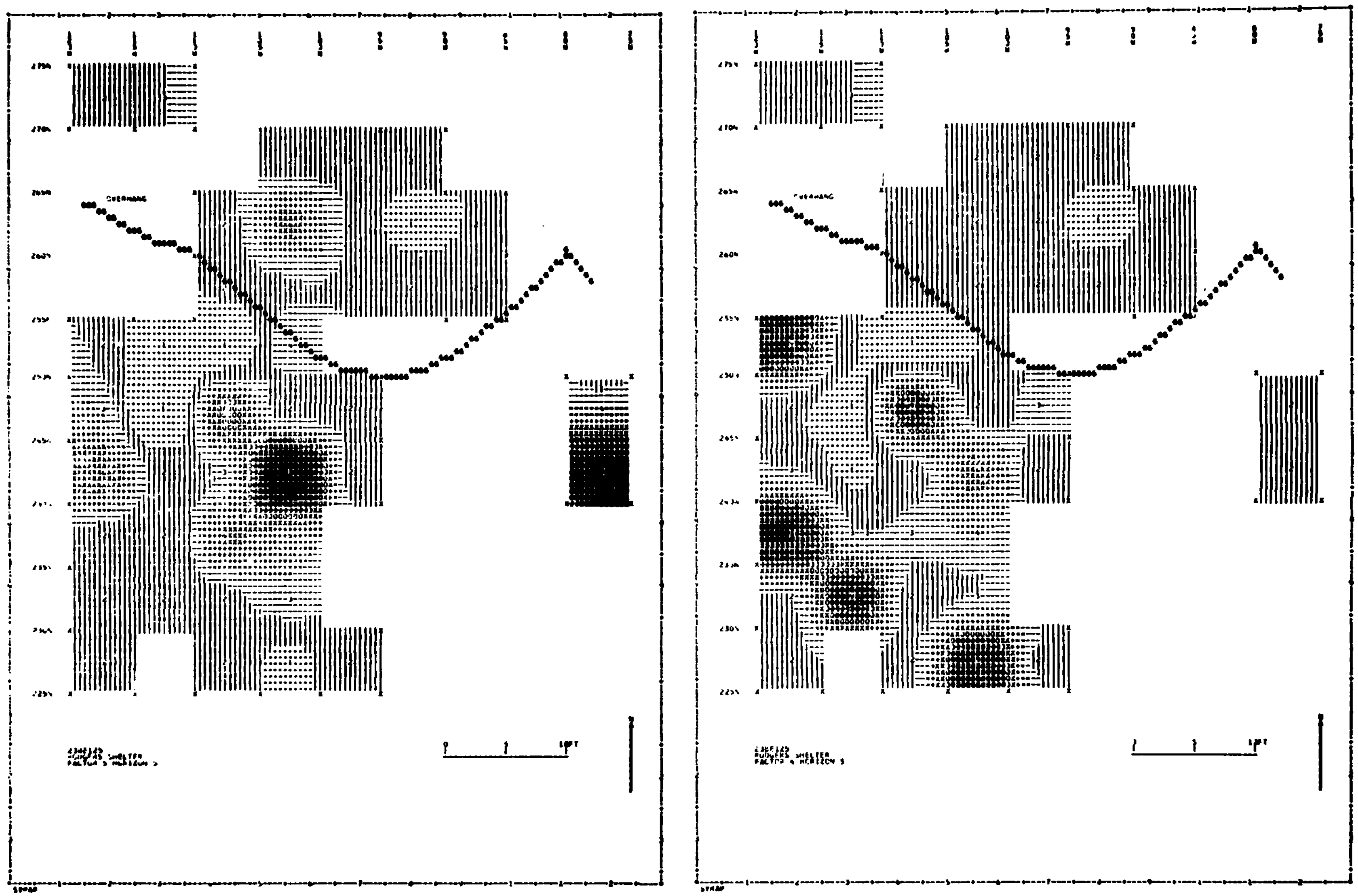

Figure 12.18. Horizon 5, Factor 5: Middle Archaic ovate preform manufacturing zones. Horizon 5, Factor 4: Middle Archaic discarded or cached bifacially thinned ovate preforms.

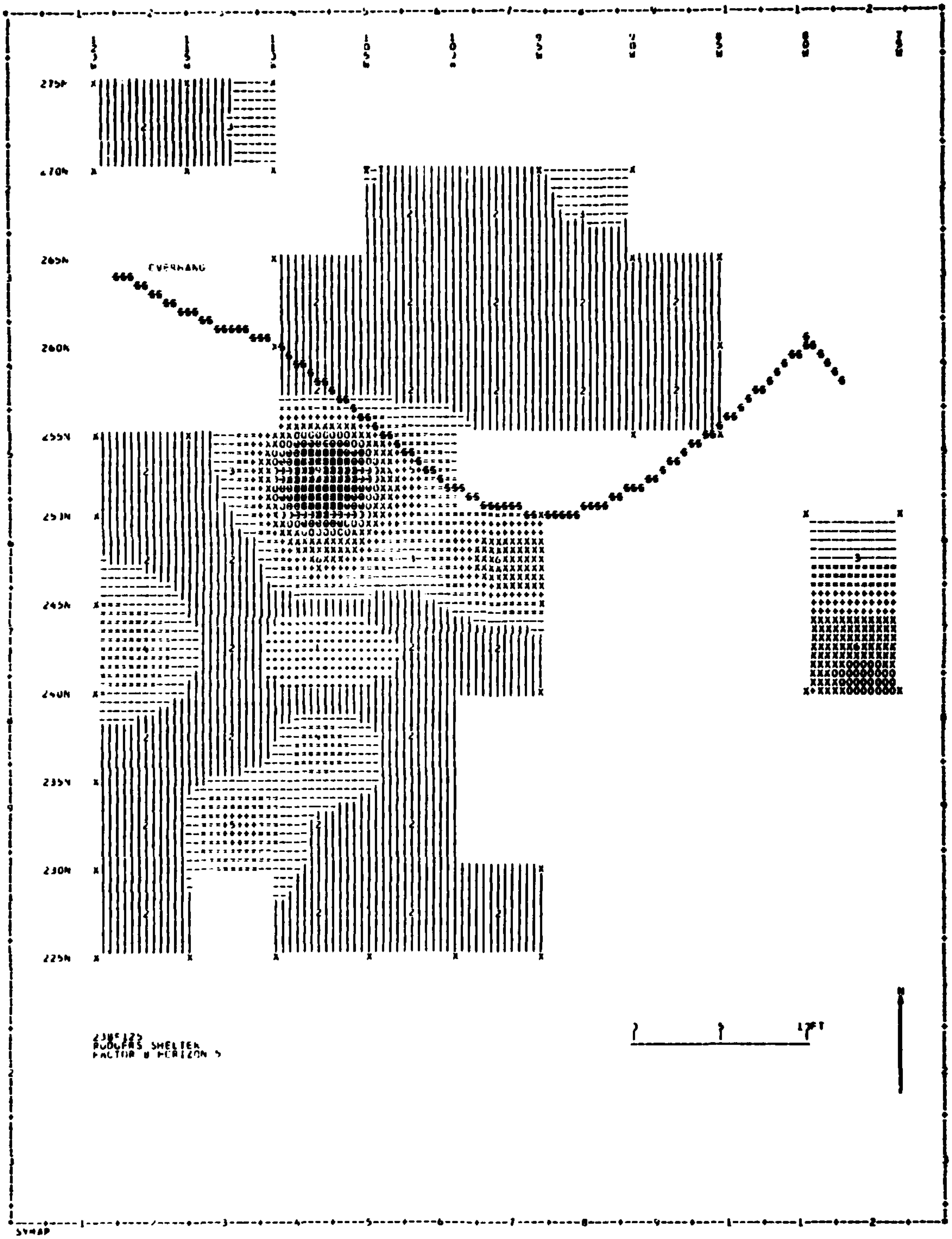

Figure 12.19. Horizon 5, Factor 8: Middle Archaic discarded or cached finely shaped ovate preforms.

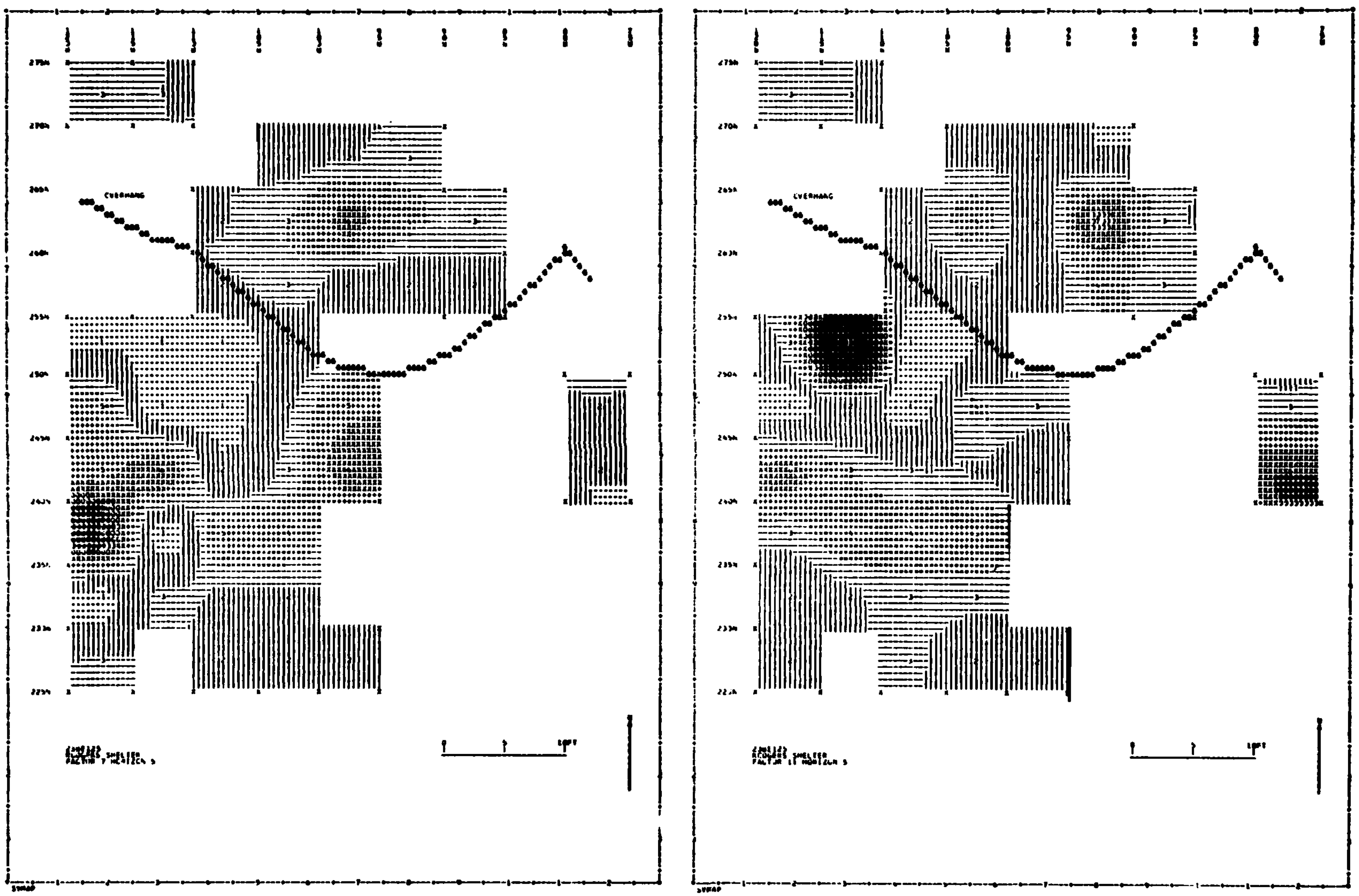

Figure 12.20. Horizon 5, Factor 7: Middle Archaic specialized scraping areas. Horizon 5, Factor 11: Middle Archaic wood working areas.

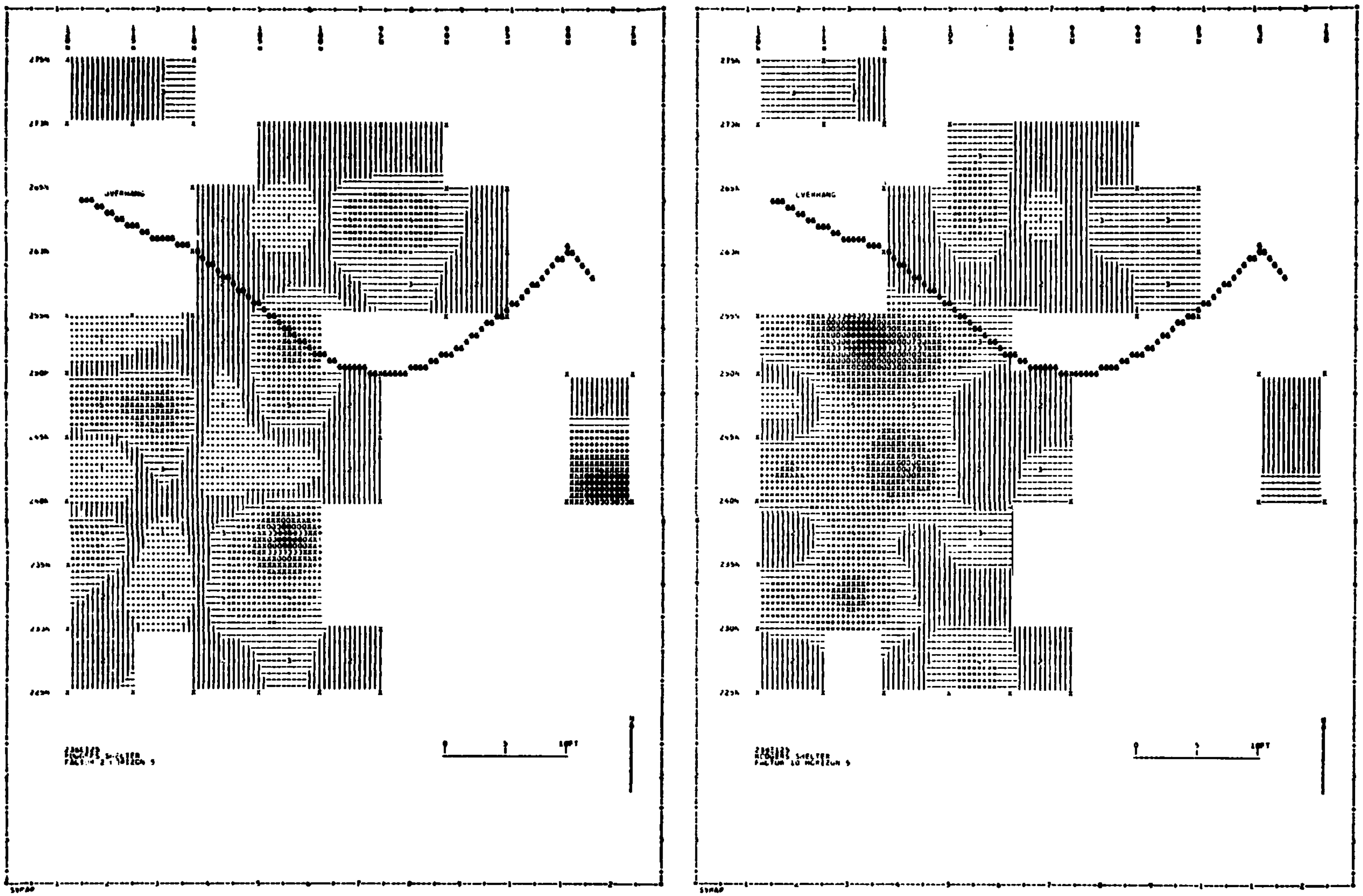

Figure 12.21. Horizon 5, Factor 2: Middle Archaic domestic and lithic reduction areas; see corresponding zones for Factor 10. Horizon 5, Factor 10: Complementary Middle Archaic tool use and maintenance areas.

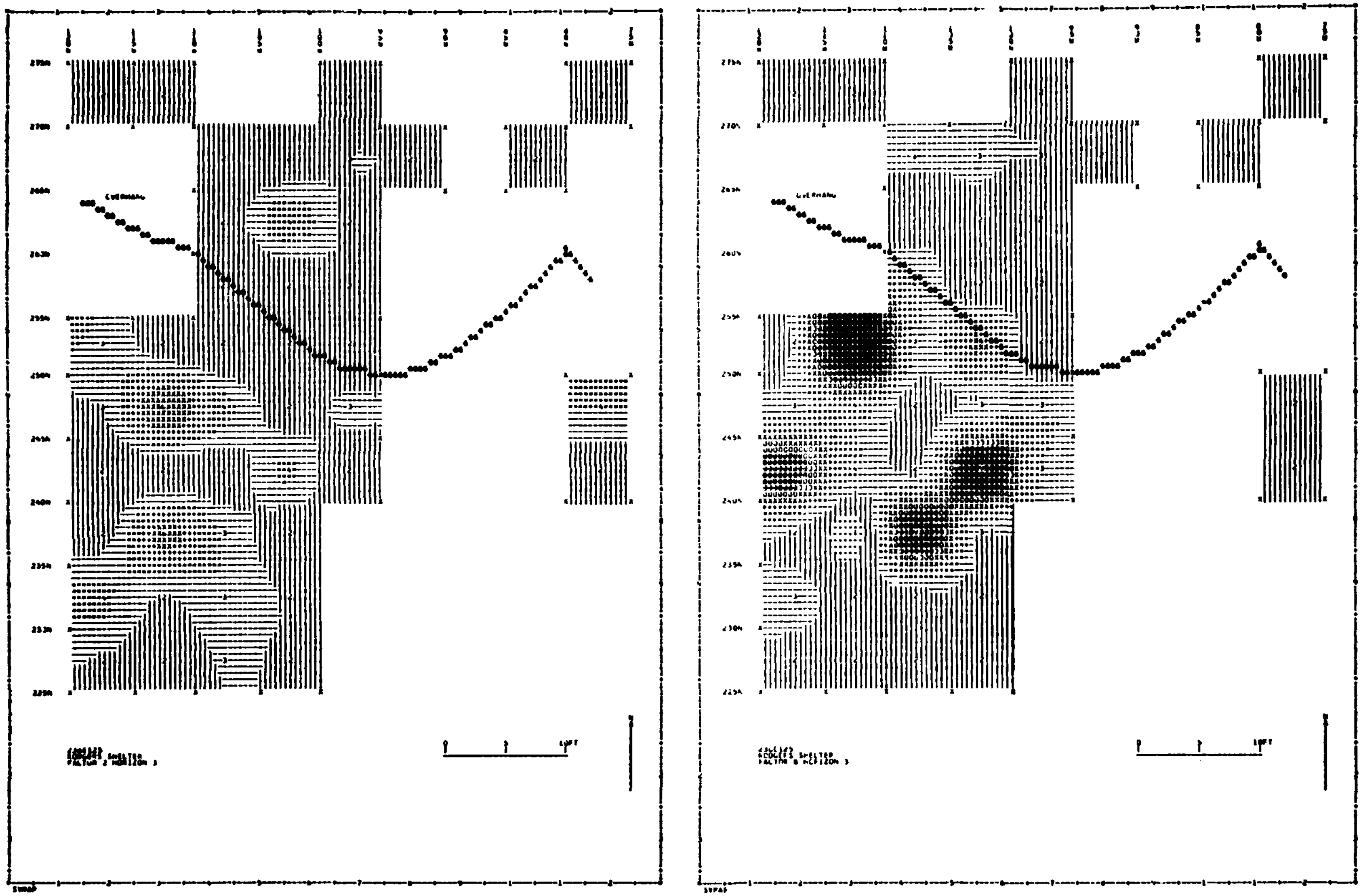

Figure 12.22. Horizon 3, Factor 2: Late Archaic domestic areas. Horizon 3, Factor 8: Late Archaic whole ovate or Smith point preforms.

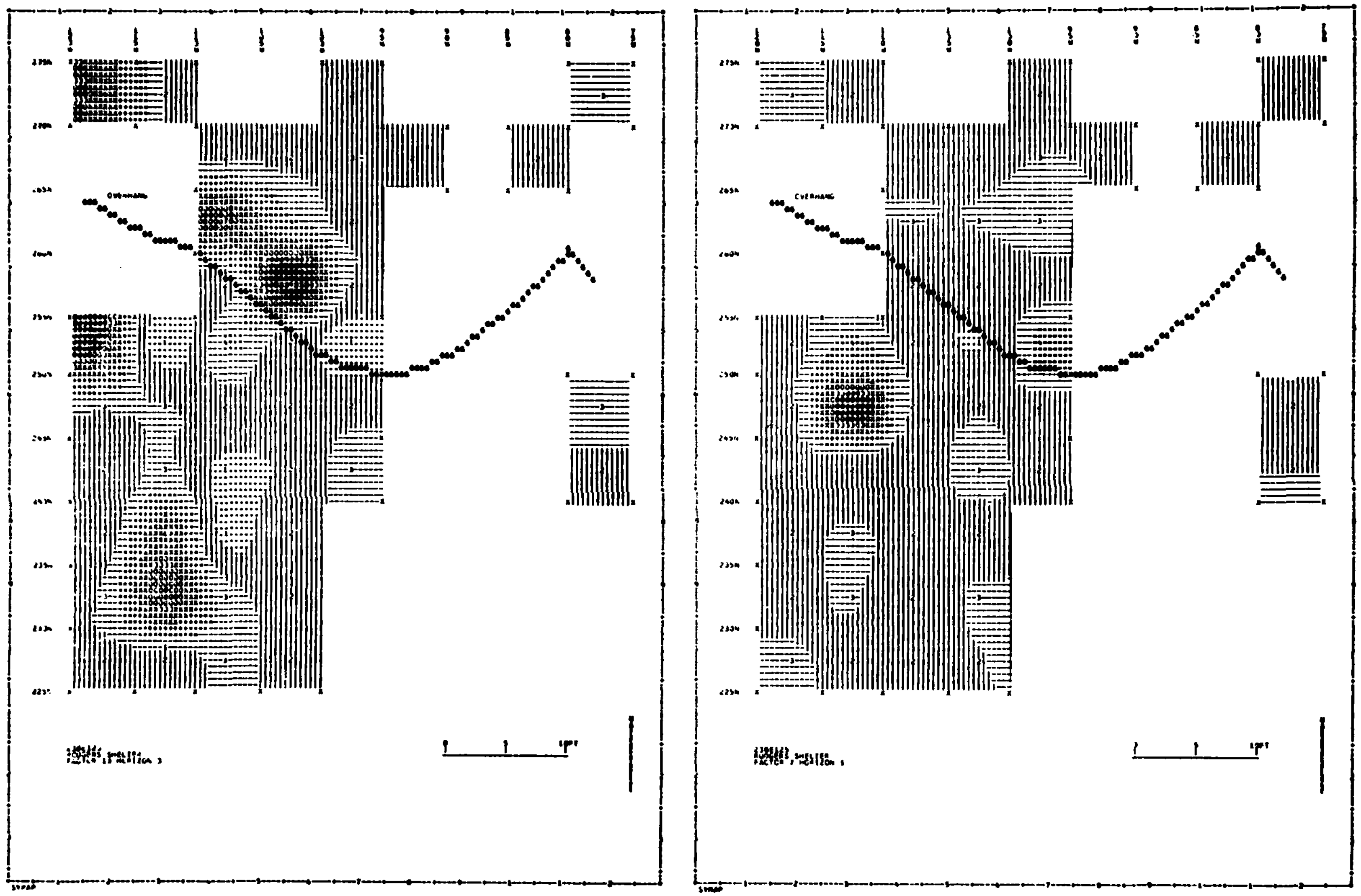

Figure 12.23. Horizon 3, Factor 13: Late Archaic whole rectanguloid preform areas. Horizon 3, Factor 7: Late Archaic specialized scraping areas.

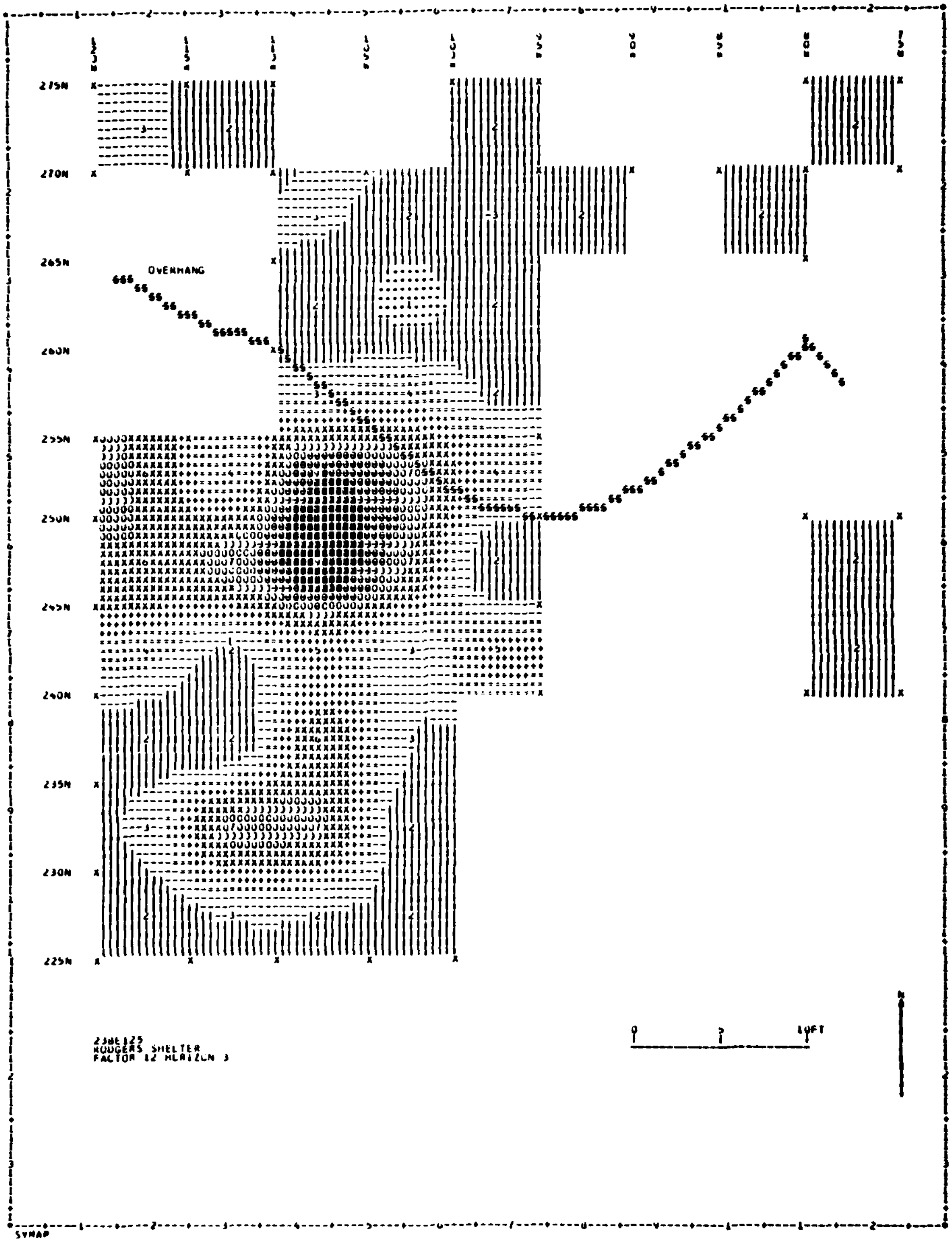

Figure 12.24. Horizon 3, Factor 12: Late Archaic specialized cutting or butchering areas.

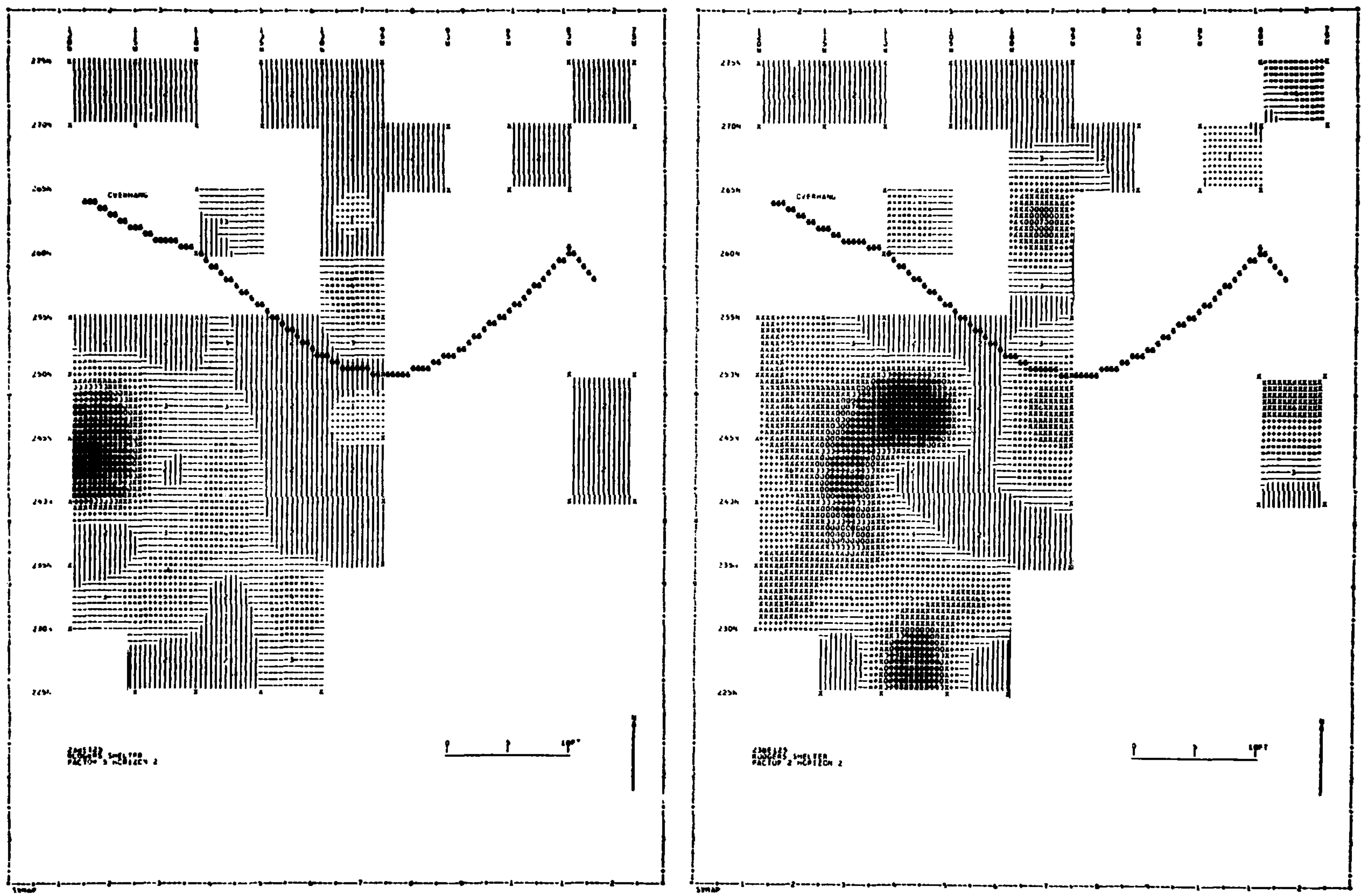

Figure 12.25. Horizon 2, Factor 5: Late Archaic/Woodland ovate preform reduction. Horizon 2, Factor 2: Late Archaic/Woodland domestic scatters.

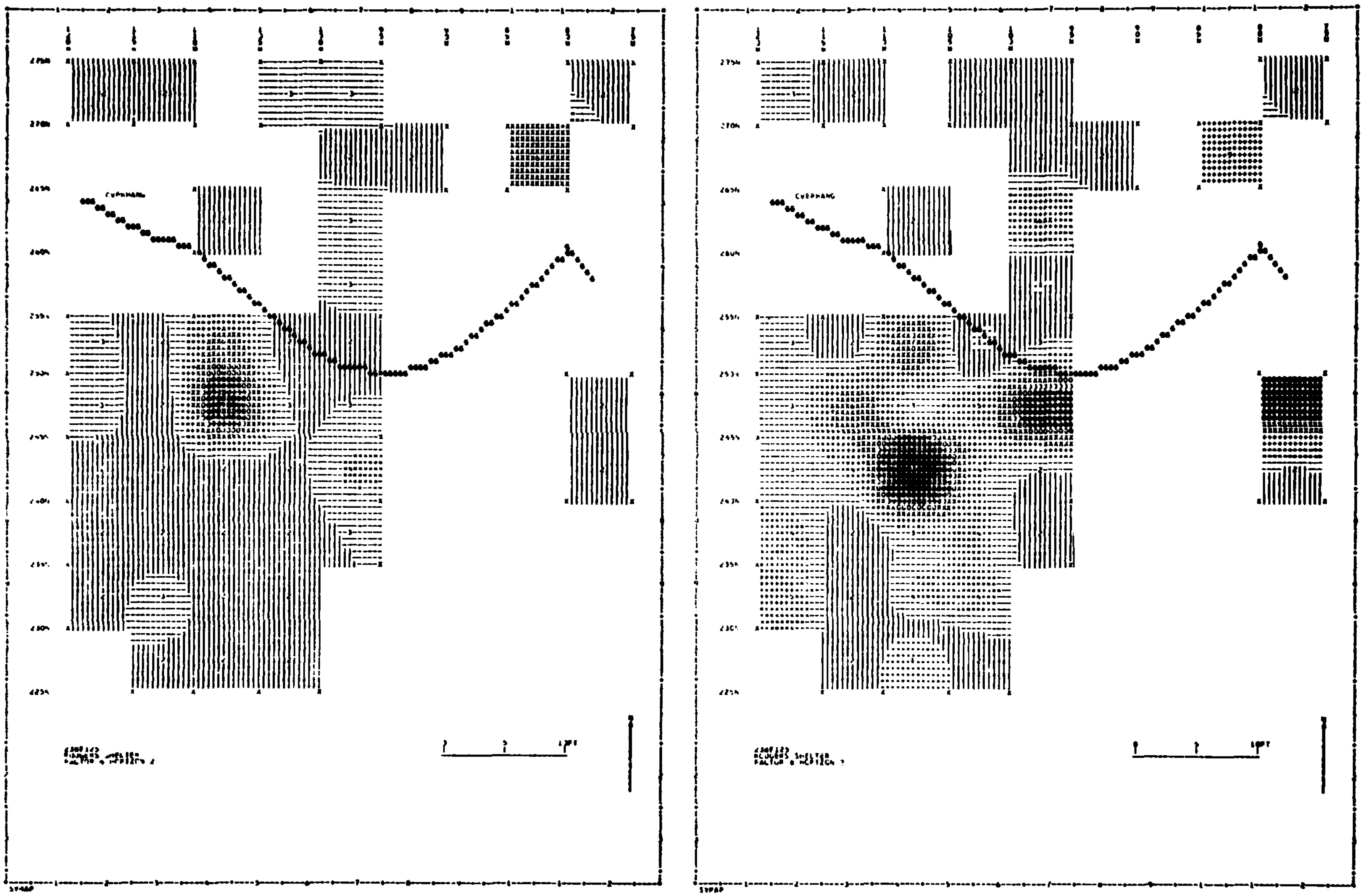

Figure 12.26. Horizon 2, Factor 4: Late Archaic/Woodland bifacially thinned whole ovate preforms. Horizon 2, Factor 8: Late Archaic/Woodland finely flaked whole ovate or Smith point preforms.

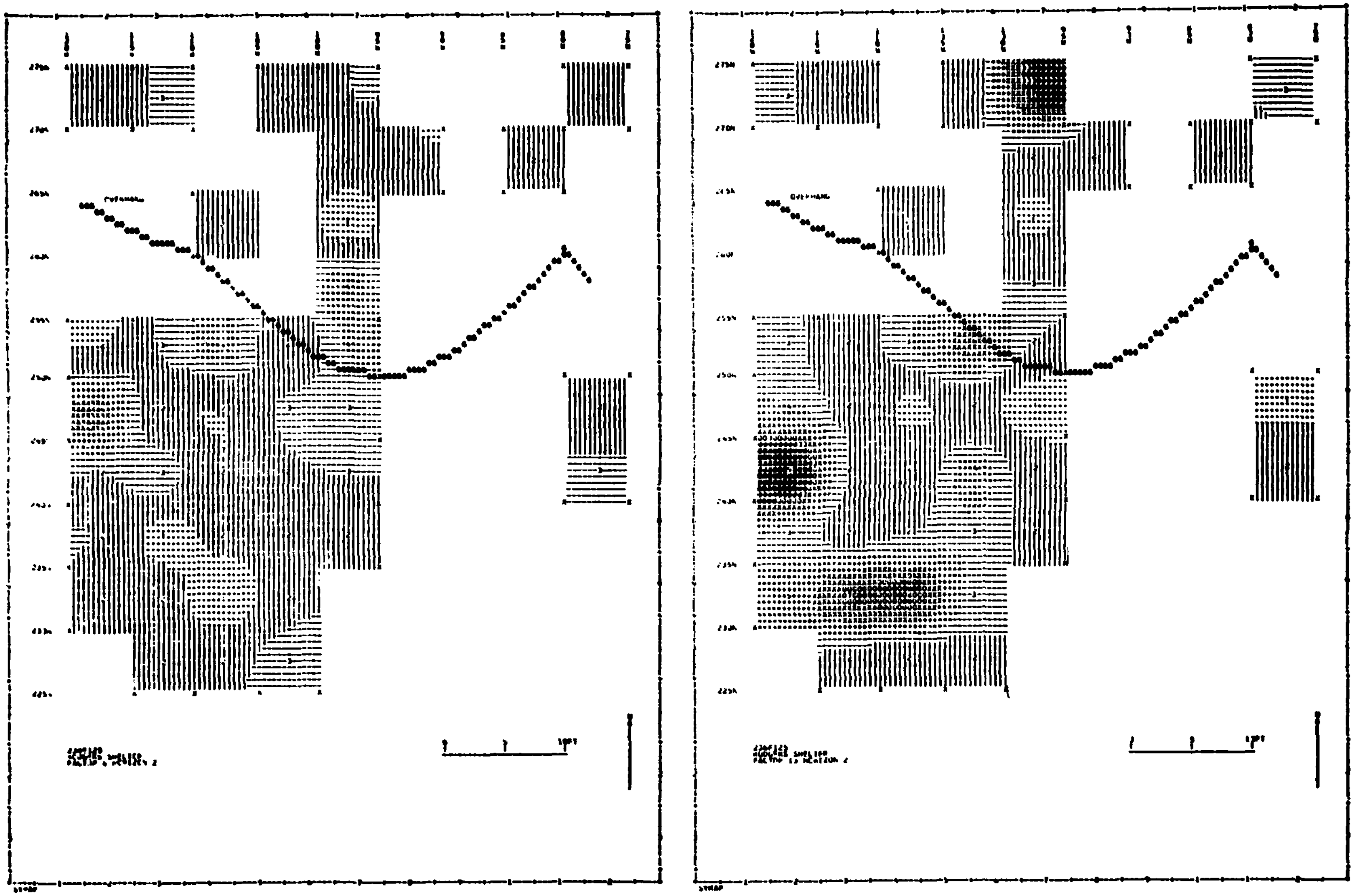

Figure 12.27. Horizon 2, Factor 6: Late Archaic/Woodland undifferentiated whole preforms. Horizon 2, Factor 13: Late Archaic/Woodland whole rectanguloid preforms; see Factor 10.

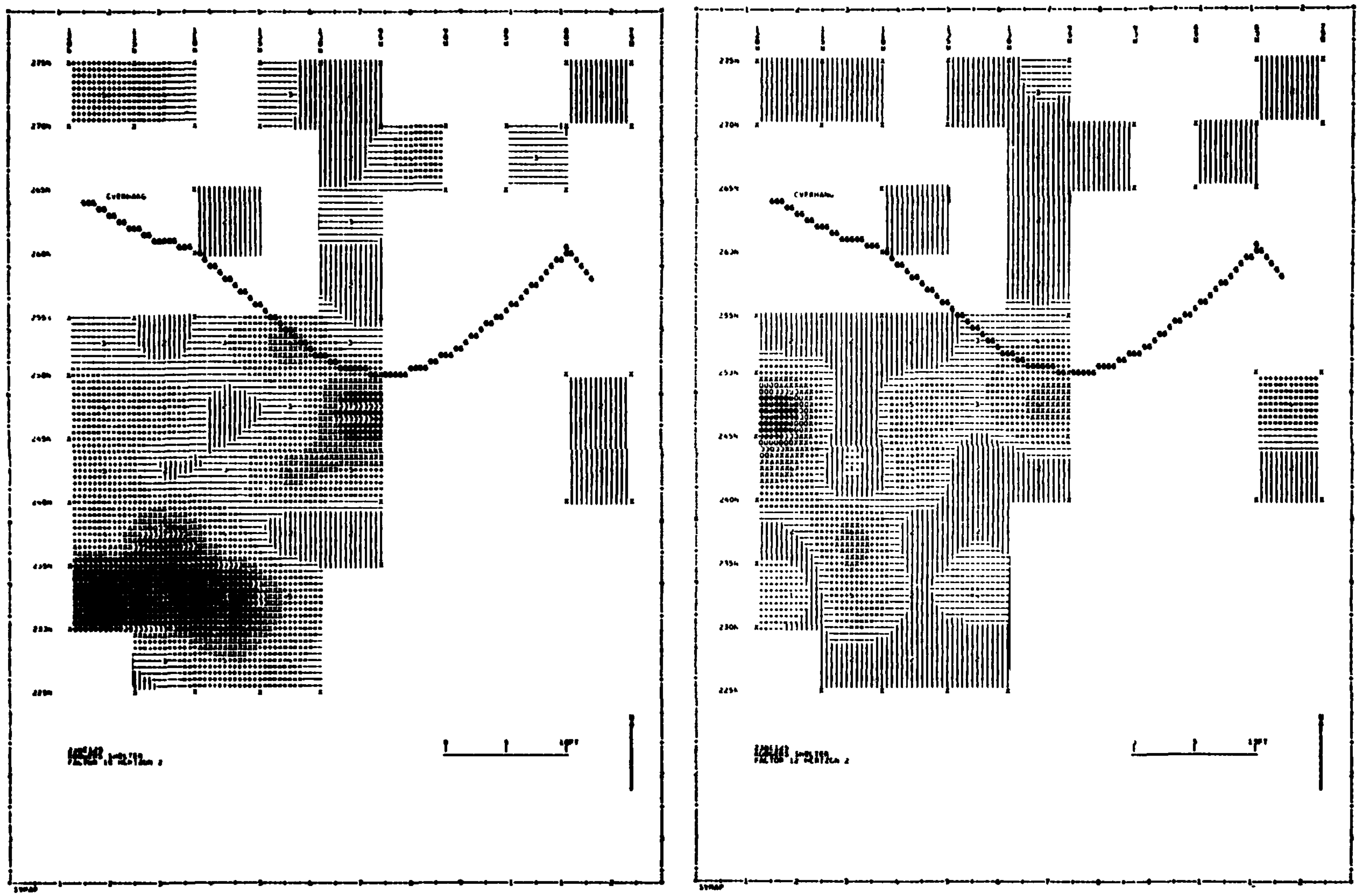

Figure 12.28. Horizon 2, Factor 10: Late Archaic/Woodland specialized use area dealing with points and other cutting tools. Horizon 2, Factor 12: Late Archaic/Woodland specialized scraping areas.

and other cutting tools (Fig. 12.29). Rectanguloid preform manufacture areas (Fig. 12.29) are subsumed within Factor 10 scatters, as indeed are all other identified activity components (Figs. 12.30 and 12.31). Factor 2, a prime indicator of food processing using ground stone implements and also manufacture of rectanguloid preforms, is but moderately represented (Fig. 12.30); more distinctive are specialized scraping tasks (Fig. 12.30) and other rectanguloid preform or notched point manufacture (Fig. 12.29) areas. In sum, the prime organization of Horizon 1 activity appears to be toward hunting, the maintenance of a hunting tool kit, and probably the processing or scraping of hides. The orientation of activity as discrete areas does not involved a dichotomous usage of the shelter or terrace.

FINAL DISCUSSION

Identifying activity and activity areas in the archaeological record is, of course, an exercise in inference and some speculation. As an inferential tool, this study's use of factor analysis is, I believe, in keeping with the complexity of the Rodgers Shelter archaeological record and allows for concise statement of interpretable activity areas through time. There are limitations, however, particularly with respect to calibrating the occurrence of activities within single cultural units. Questions must remain about the coevalness of activity for discussed cultural horizons. But as empirical models, I think we can view these results as representing either coeval activities occurring over relatively short periods, or, if of longer duration, showing remarkably consistent patterning for any one cultural horizon.

As a first observation, "activities areas" in each horizon display an organic quality. That is, to one degree or another, they show a partitioning of activities with centralized "core" processing or lithic reduction zones and peripheral discard, cache or specialized use areas. On a more technical level, the reduction of bifacial preforms is largely consistent among the Archaic horizons: in each case, ovate and rectanguloid preform reduction involved separate areas though final modifications often occurred within a central "domestic" core. Each of the larger domestic areas, delineated by a combination of factors, share basic features in common within any one horizon and may or may not be offset by specialized zones for extractive activities. The latter case may imply sexual differentiation in domestic and associated specialized use areas.

The potential for differentiating sexually specific tasks and areas at Rodgers Shelter is admittedly speculative. But as mentioned above, some speculation may be warranted as a limited number of extractive and tool maintenance tasks appear to be differentially located in most cultural horizons studied. Specifically, the placement of inferred butchering (Factor 12), hide scraping (Factor 7) or manufacture-use-maintenance areas for projectiles as well as other cutting tools (Factor 10) are often separate from the main food processing/bifacial reduction (domestic) areas. Assuming that grinding of vegetal foods was mainly a female activity and that most flintworking was done by men, the domestic areas would have been zones of joint use by both sexes. Specialized tasks may have been sexually keyed, with butchering and/or projectile point use areas perhaps being male dominated, while hide scraping may have been a female oriented activity.

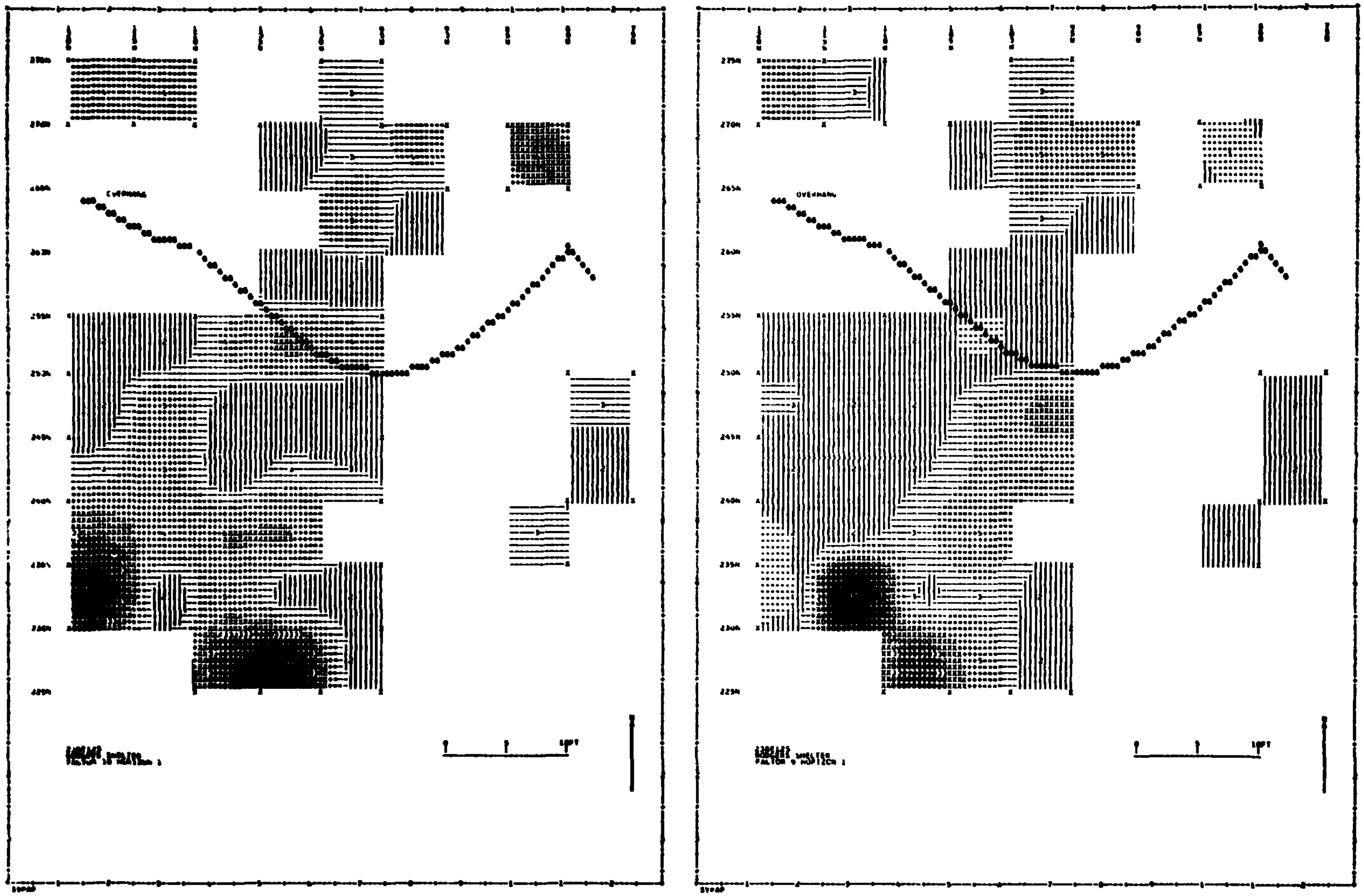

Figure 12.29. Horizon 1, Factor 10: Woodland/Mississippian projectile point and other cutting tools manufacture, use and maintenance areas. Note correlation with other activity zones for Horizon 1. Horizon 1, Factor 9: Woodland/Mississippian rectanguloid preform manufacture areas.

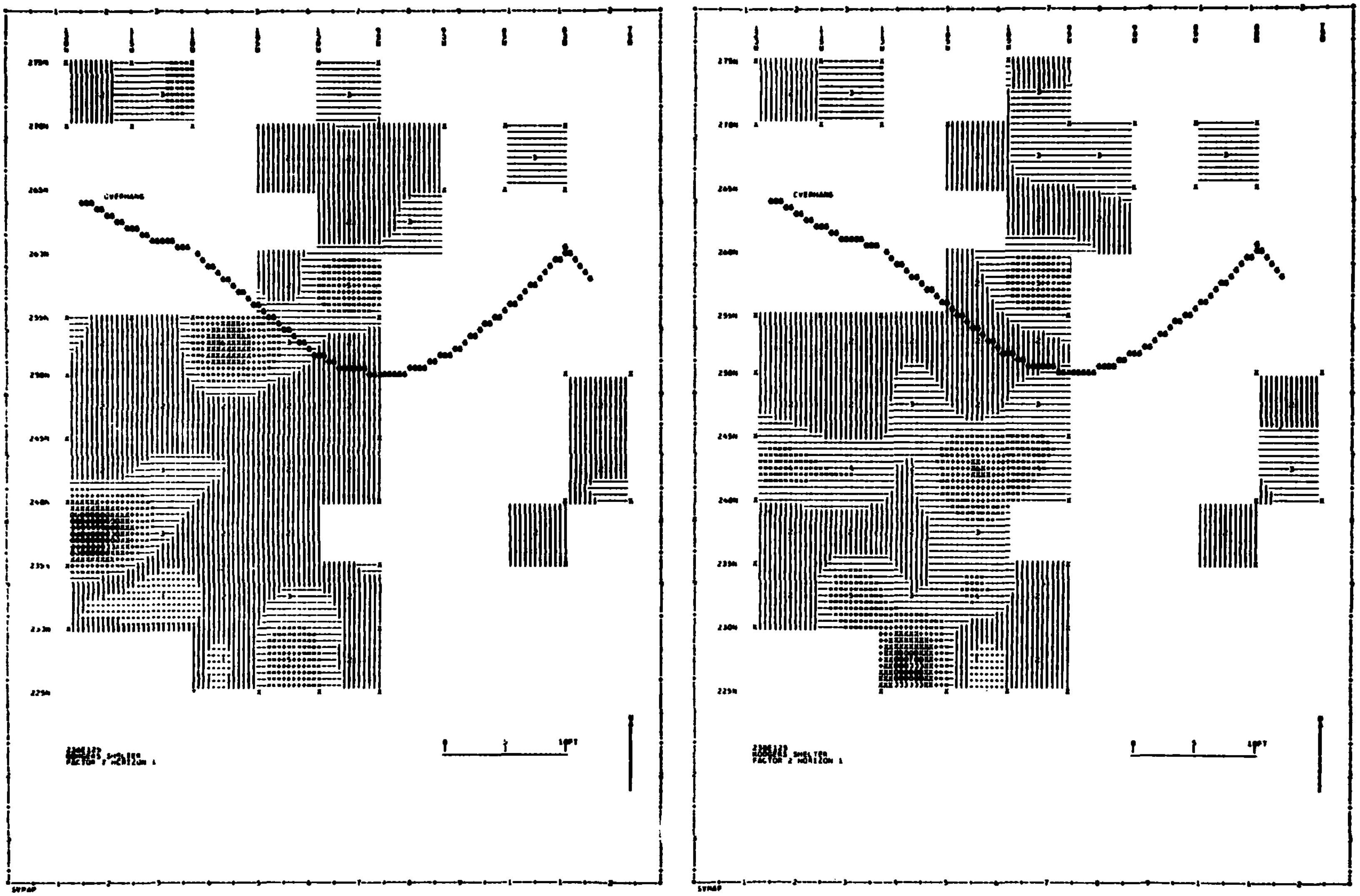

Figure 12.30. Horizon 1, Factor 7: Woodland/Mississippian scraping area. Horizon 1, Factor 2: Woodland/ Mississippian domestic (food processing and rectanguloid preform manufacture) areas.

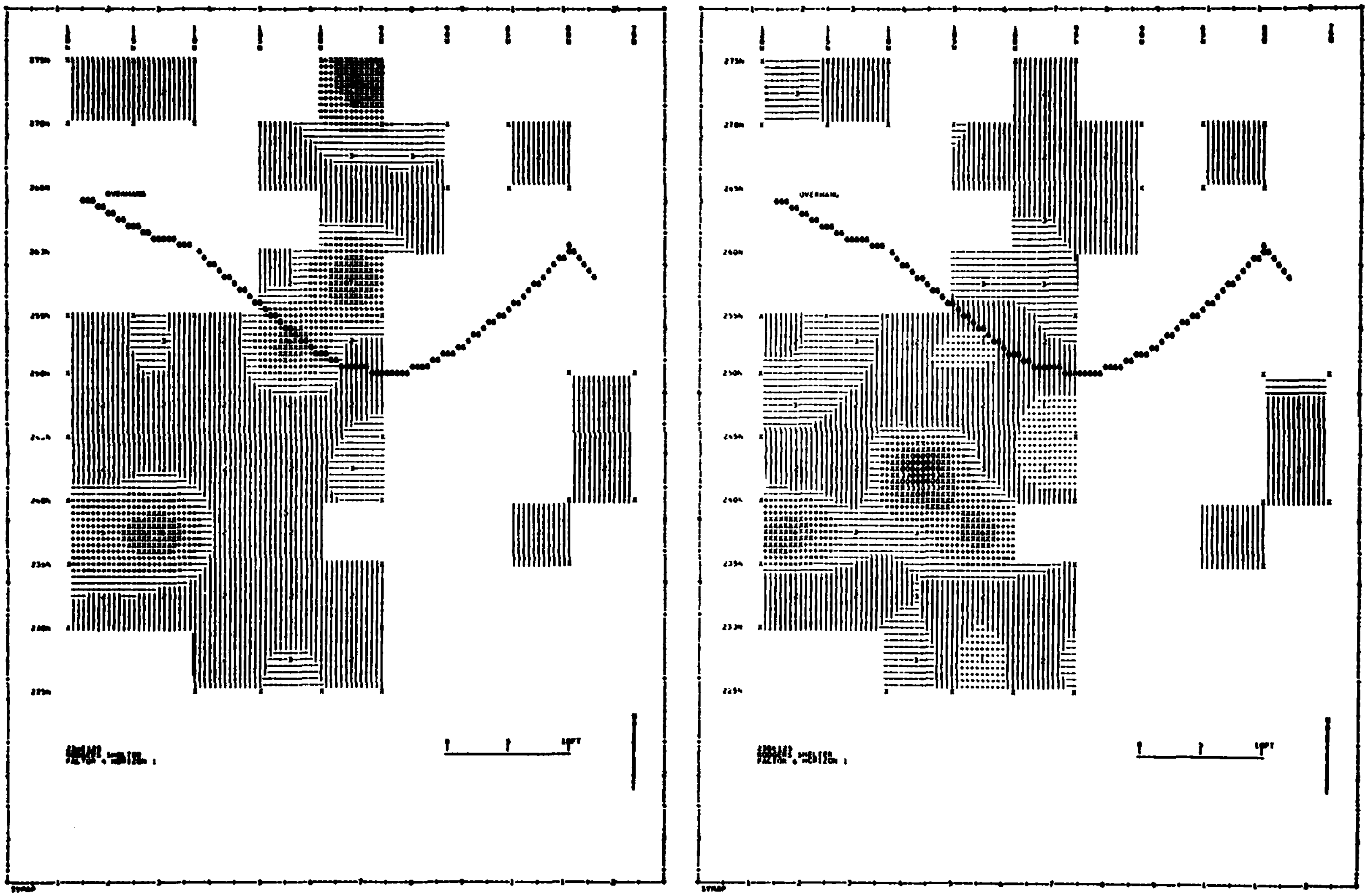

Figure 12.31. Horizon 1, Factor 4: Woodland/Mississippian bifacially thinned whole ovate preforms.
Horizon 1, Factor 6: Woodland/Mississippian undifferentiated whole preforms.

A second observation is that prime domestic areas vary in size and number. Horizons 5 through 7 each have single large domestic areas; Horizons 8 and 3 have several small areas; multiple large domestic areas exist in Horizon 2, while for Horizon 1, truly domestic areas in the sense of the earlier components are absent but there are areas of variable size for butchering and maintenance of hunting tool kits.

Correlated with differences in size and number of domestic areas are concomitant changes in primary site use, summarized as follows.

1. During the Early Archaic Horizon 8, and perhaps the preceding Dalton occupations as well, small nuclear areas scattered along the Rodgers floodplain were prime centers for lanceolate point manufacture and possibly some hematite processing.

2. Early and Middle Archaic Horizon 7 illustrates a basic change in both the scale and orientation of activity. The shelter became the dominant area of extensive domestic use, and was a prime focus of industrial activities including hematite processing but also involving chipped stone tool manufacture. Extractive tasks also centered within this domestic areas. Structural and botanical data indicates prolonged seasonal use probably going through the winter.

3. Similarly, large scale site use is evident for both Middle Archaic horizons 6 and 5 but main domestic areas were south of the overhang on the terrace. This may indicate a shift in seasonal occupancy of the site. Basically, the same range in tasks and intensity of use occurred; as before, hematite processing was the major industrial activity.

4. Beginning with the Late Archaic Horizon 3, there is an abrupt change in predominate site activities. Dichotomous usage of the shelter or terrace is not as appparent, nor is there a single large scale domestic area. Hematite processing as a major activity ceases. What is most striking about Horizon 3 is the extensive specialized cutting or butchering areas defined by Factor 12.

5. Subsequent occupation during Late Archaic/Woodland Horizon 2 seemingly increased in scale and complexity of domestic areas that are separable from areas of manufacture, use and maintenance of points and other cutting tools. Specialized scraping activities are encompassed within the domestic areas.

6. Final occupation of Rodgers Shelter by Woodland and Mississippian groups is reflected mainly by extensive areas organized about hunting or the maintenance of hunting tool kits.

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CHAPTER 13

PHILLIPS SPRING EXCAVATION AND ARCHAEOLOGY

Christine K. Robinson and Marvin Kay

SITE SETTING

Phillips Spring (Fig. 13.1) is an active artesian spring located on the east bank of the Pomme de Terre Valley in north central Hickory County, Missouri. The site is 5.65 km southeast of Rodgers Shelter and, like Rodgers Shelter, it is located on Terrace-1b of the Pomme de Terre River, at an elevation of 210 m (690 feet) above sea level.

The site consists of the spring, which discharges roughly 104.7 liters (26.6 gallons) of water per minute, and an area of 4 hectares about the spring (Chomko 1976:110). The spring flows year round and the area immediately surrounding is being cultivated.

RESEARCH HISTORY

Phillips Spring was located by R. Bruce McMillan, James E. King and C. Vance Haynes in 1973 during a survey of potential Pleistocene Pomme de Terre springs. A small backhoe trench, cut into the northeastern edge of the spring, revealed an impressive archaeological component buried 1.5 m below the surface and a second component at 3 m. The upper component dated an average of 4280±50 B.P. and the lower component, from which King (Chapter 15) later identified pollen, dates 7870±90 B.P. (SMU-78). Recognizing an opportunity to add to both the paleobotany and archaeology of the lower Pomme de Terre, a proposal was submitted to and funded by the National Park Service for excavation of the spring the following summer with W. Raymond Wood as Principal Investigator. Excavations commenced in 1974 under the field direction of Stephen A. Chomko.

The 1974 research consisted of a 1.5 x 3 m unit near the spring and three 2 x 2 m squares; one to the north and two to the south of the spring and has been recently summarized by Chomko (1978; Chomko and Crawford 1978). Two extensive backhoe trenches were placed along the north and west axes of the site. A systematic surface collection (Downer 1977) was also conducted in an attempt to define the total surface area of the site.

The limited excavations in 1974 defined three or four cultural components; the previously identified Late Archaic component, provisionally dated at 4280 B.P.; a Late Archaic component dated at 3050-2910 B.P.; another Late Archaic component dated at 2340 to before 1990 B.P.; and a Woodland component dated at approximately 1950 B.P. (Chomko 1976). Of particular interest is the earliest component which potentially had the tropical cultigen, squash, initially recovered from Trench 3, a short backhoe trench located in the southeast wall of the excavation near the spring.

Presence of late Hypsithermal occupation at Phillips Spring and

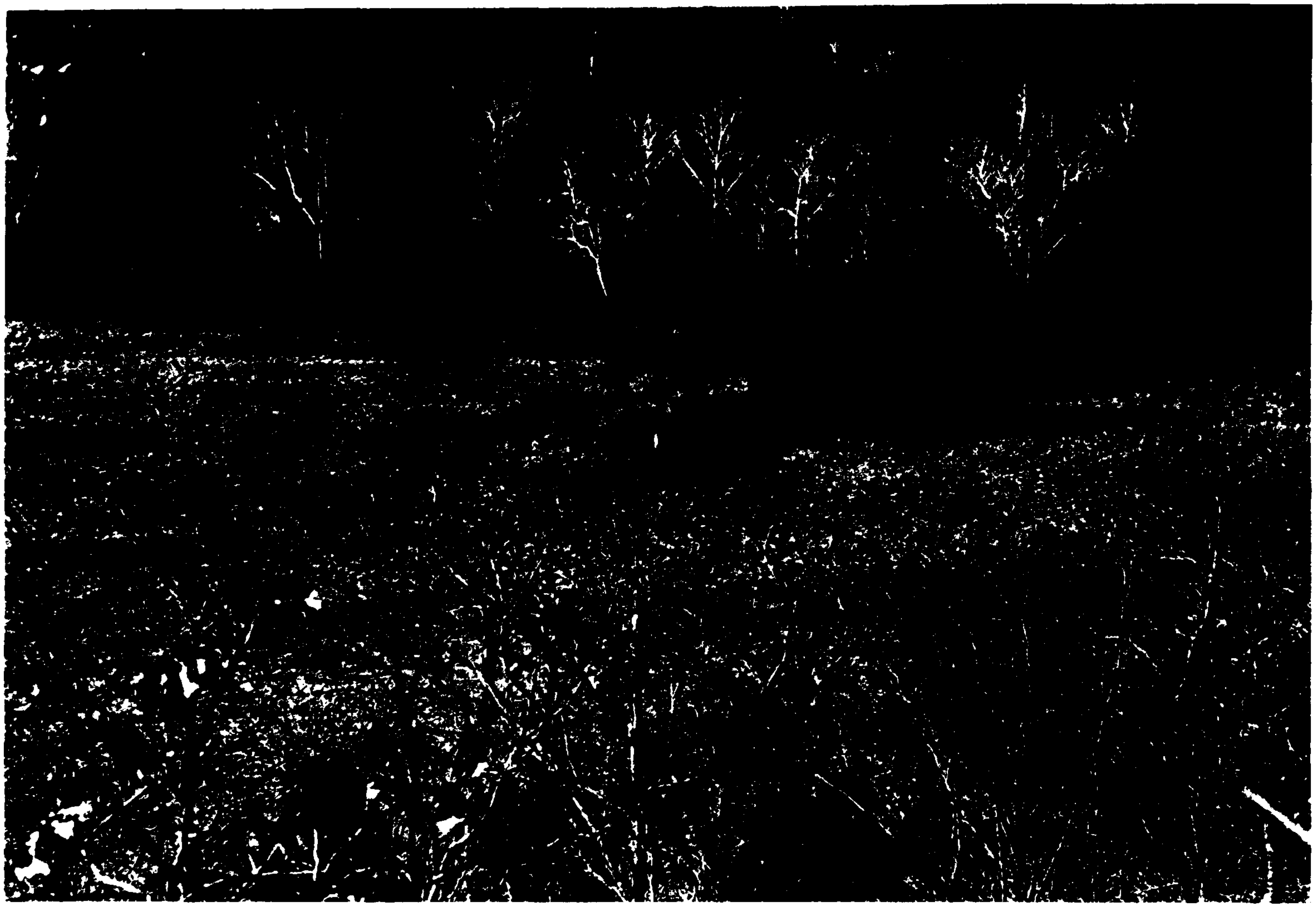

Figure 13.1. View of Phillips Spring after excavation in 1974, looking west; 1977 excavations were on the northeast side of the spring.

squash in a context potentially predating other examples in eastern North America, prompted additional testing of the site in 1976 by Kay. Two backhoe trenches were placed along the east-west axis of the site, connected by a third small trench. Haynes (1977:30) illustrates these units. A single meter square, Square A, was excavated directly in the spring bog. Pollen samples were taken from the north wall of Trench 5 and numerous probe holes were cored into deposits east of the spring.

During the testing of Phillips Spring in 1976, the component thought to be associated with the squash was relocated in both backhoe trenches (4 and 5). Two radiocarbon dates of 3938±66 B.P. (SMU-419) and 3995±96 B.P. (SMU-423) were from charcoal from this component, which is composed of concentrated burned dolomite, charcoal, flaking debris and artifacts characteristic of the Late Archaic at Rodgers Shelter. Figure 13.2 illustrates the 1973-1977 excavations.

Based on the available evidence, Kay notified the Corps of Engineers Kansas City District in August 1976 that Phillips Spring was eligible for nomination to the National Register of Historic Places and later submitted a proposal for amendment of the Rodgers Shelter contract to continue excavation. This proposal was accepted and the contract was accordingly amended. Extensive excavation was conducted in 1977 by Kay and Robinson served as field assistant. The research proposed to: (1) Recover additional Holocene pollen samples; (2) investigate the late Hypsithermal components; (3) define the stratigraphic context of the squash recovered in 1974; and (4) define the anatomy of the spring and its relationship to Terrace-1b.

Table 13.1 summarizes the record of excavations at Phillips Spring.

TABLE 13.1

Record of Excavations at Phillips Spring, Missouri

Date	Field Supervisor	Director	Sponsoring Agency
June-August 1974	Chomko	Wood	National Park Service
July 1976	Kay	McMillan	Corps of Engineers
June-July 1977	Kay	McMillan	Corps of Engineers

SPRING DEWATERING

Excavation of Phillips Spring is contingent on dewatering requiring twenty-four hours per day evacuation of the artesian discharge. Since 1974, electrical pumps, powered by either gas or diesel generators have been used for dewatering from three or four wells (a fourth 8-inch diameter well was placed over the conduit in 1977 and effectively controls discharge).

The 1977 dewatering program began a month prior to excavation and can only be described as a near-failure. The summer was one of the wettest in recent memory in sharp contrast to the preceding 1976 field

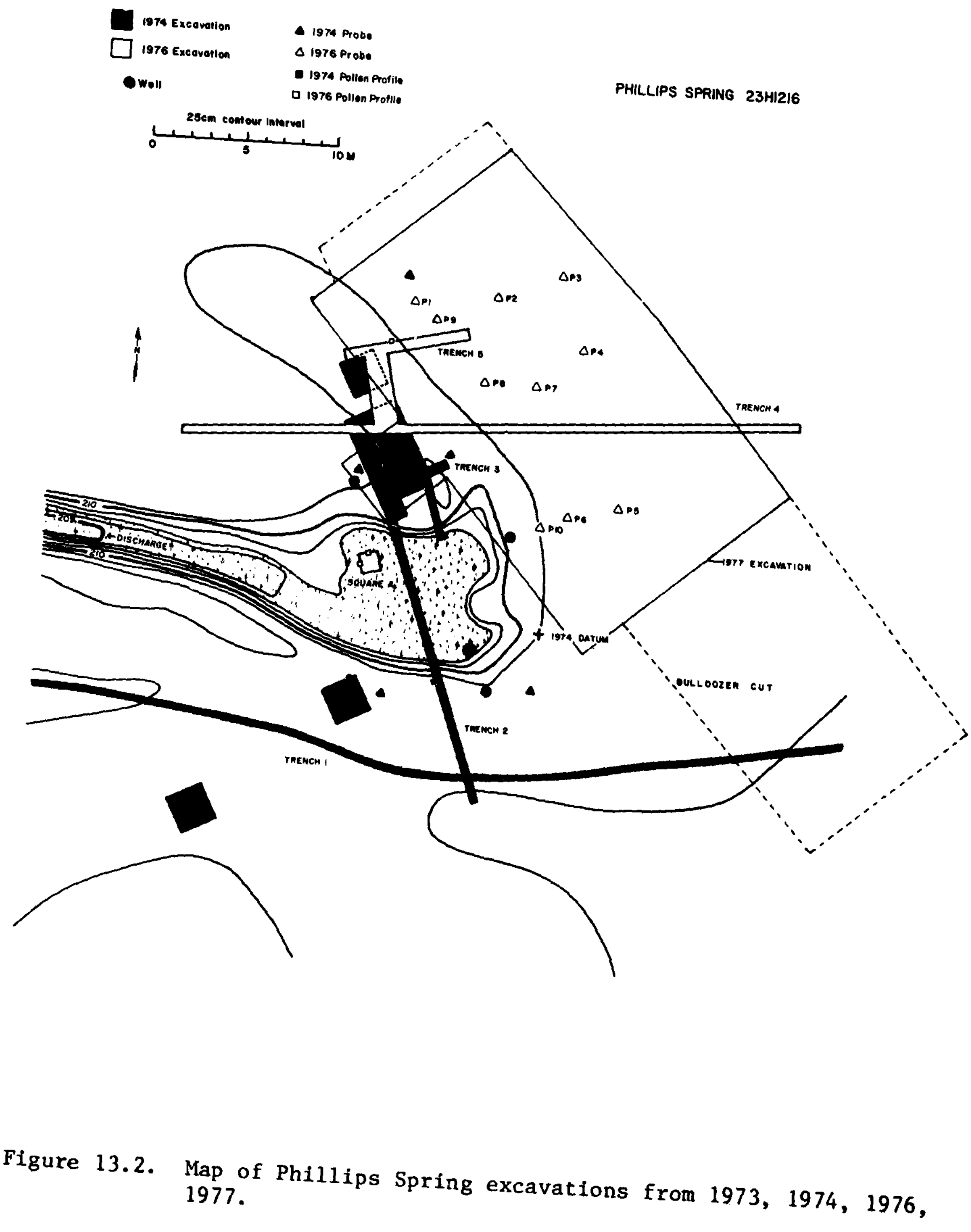

Figure 13.2. Map of Phillips Spring excavations from 1973, 1974, 1976, 1977.

season, when it rained but once at Phillips in three months. During May and June, 1977, it rained almost daily, sometimes as much as eight inches in a single storm. This affected spring levels directly and created a higher than normal water table, in part controlled by the level of the Pomme de Terre River just west of the spring. But the major defect of the dewatering system lay in the sources of electrical power. Several generators were employed which, though rated for continuous duty, invariably broke down. As the eight week season wore on, generator problems became more frequent and finally crippled the operation.

Although the weather could not have been controlled, a more reliable source of power would have been an electric power line. A power line was used successfully to run pumps at nearby Jones Spring during the same period. In spite of the rain, Jones Spring was excavated at depths of 4 to 6 m below the surface. In fact, the 1977 proposal included employment of a power line for Phillips, but we were advised by the Kansas City District that due to the need of environmental clearance, this would be impossible.

SAMPLING

The 1977 excavation block was established directly east of the spring. It was specifically designed to expose an extensive area of the site to facilitate observations of the spatial distribution of artifacts and features across the site at one time. The 1977 grid differs from the Rodgers Shelter grid system in that it assumes a south and east point of origin to facilitate the use of SYMAP (see Chapter 12) and is calculated in meters. Grid units are named in the northwest corner by the number of meters south and east of an arbitrary point of origin. Vertical provenience, was recorded with a farmer's level and a stadia in reference to a permanent datum established in 1976. Previous excavations have been remapped according to the 1977 grid but it has not been possible to correlate 1974 vertical controls.

A bulldozer partially cleared the overburden above the late Hypsithermal component thought to be associated with the early squash remains (i.e., the extensive component sectioned in 1976). The bulldozer cut was 42 x 11 m and was oriented 340° (Fig. 13.2), designated grid north. Bulldozer operations were terminated at an average of 0.75 m when sparsely distributed Late Archaic debris were encountered. The bulldozer had also reached a depth where the sediments were still plastic and the weight of the bulldozer began to deform the deposits.

From the base of the bulldozer cut, the 1976 backhoe trenches were re-excavated. The base of the bulldozer trench was roughly 0.75 m above the component dated in 1976. As a result, overburden clearance was resumed by hand in 4 m squares excavated in 30 cm levels. Identifiable *in situ* artifacts were mapped by triangulating the distance from the SE and SW corners of each 4 m square unit. Miscellaneous chipping debris and natural rock was bagged by 4 m square and given appropriate 30 cm vertical designation.

A major occupation floor consisting of concentrations of rock and pit features was defined after removal of the first 30 cm level, and

attempts to further remove overburden were discontinued. The excavation was expanded to a final 24 x 13 m block and a meter balk was left along the 516E line as a profile, and served as well as a wheelbarrow ramp. Diagnostic artifacts indicate this is a Late Archaic component, roughly of the same age as the basal Late Archaic components at Rodgers Shelter and Blackwell Cave (Wood 1961; Falk 1969).

Excavation of this component was in 2 m square units with small pick mattocks, trowels, and small tools such as dental picks and brushes. The units were excavated in 10 cm levels or natural stratigraphic units of less than 10 cm when possible. Features such as pits and post molds were cross sectioned and, in the case of pits, 10 cm balks were left in the center for profiling purposes. Artifacts found *in situ* were located by triangulation and vertically provenienced as discussed in relation to the 4 m square unit overburden clearance. The remaining deposits from each 10 cm level or natural stratigraphic unit were processed through the water screening and flotation system, as follows:

The recovery system used at Phillips Spring was a modified version of the system used at Rodgers Shelter in 1976 (Chapter 3). The flotation barrels were attached to an air compressor. The resulting agitation greatly increased efficiency. The discharge from the Spring was also diverted for use as a water source which cut down on the contamination river water would have introduced. The matrix from each 10 cm unit excavated was water screened through a series of nested screens of varying sizes from 3" to 1/16". The 1/16" fraction was then dried and soaked in trisodium phosphate (TSP) to disperse clay. Virtually all the matrix from the site required treatement with TSP before it could be effectively floated. Matrix from storage pits and the early squash horizon was directly floated without passing through the water screens to insure near-total recovery.

The extensive Late Archaic component excavated at Phillips Spring was photographed at a uniform scale in meter intervals. This technique was used in order to totally reconstruct the component floor in a photo-mosaic. In addition, standardized forms and maps were recorded for profiles, features and each 10 cm level excavated at Phillips Spring.

Soil samples were collected for each 10 cm unit excavated at Phillips Spring. Within the extensive component excavated, selected feature areas were gridded off into 0.50 m square units and soil samples were collected for each unit. All unmodified rock debris from the extensive rock features was also collected in the 50 cm square units.

A 2 m square, encompassing Trench 3 (Chomko 1976) was removed in arbitrary 10 cm levels and, later, natural stratigraphic levels from the base of our 1977 excavation in a final attempt to delimit the area where cultigens were found in 1974. Due to collapse of the north portion of the square, it was practical to float sediments only from the area south of Trench 3; and recordings were made only for the Trench 3 south wall profile and the south wall of the excavation.

Multi-spectral color photographs were taken of an early squash horizon in addition to standard photographic techniques in this test unit. Additional soil, gastropod and the pollen samples were collected from the profile in this deep test.

Four 2 m square units were excavated east of the wheelbarrow ramp for stratigraphic control. Figure 13.3 summarizes the 1977 excavation units at Phillips Spring. Figure 13.4 shows excavation during the final week and illustrates most of the procedures followed.

THE ARCHAEOLOGY OF PHILLIPS SPRING

Four provisional archaeological components were partially excavated at Phillips Spring during the 1977 field season. A single component was extensively sampled in a 24 x 13 m block. Below this, three components were sectioned in the excavation of a 2 m unit (510SE508). And two more deeply buried components were identified in piston core samples taken for pollen analysis, the lowest may correlate with the 1973 date of 7870±90 B.P. (SMU-78).

The most extensively excavated component is the primary subject of this report. This Late Archaic (Upper Sedalia) component is composed of storage pits, large work areas and post molds, distributed across the excavation block (Fig. 13.4). Block excavation of this component allows an intensive study based on the multiplicity of features and cultural remains. Discussion and interpretations of two other Late Archaic components, observed in Sq. 510SE508, are more limited in scope. However, this information is important to the understanding of aboriginal occupation in the lower Pomme de Terre Valley during the Late Hypsithermal and to tracing the development of prehistoric plant cultivation in eastern North America in general. Discussion of the final component sectioned in this 2 m square entails only an associated radiocarbon date, the stratigraphic location of the component in relation to the other three components, and a summary of ethnobotanical specimens. Artifact and unmodified rock debris analyses patterned after those summarized in Chapters 10 - 12 are still in progress. Ultimately, these will afford a data bank for systematic intra and intersite comparisons. We feel that as an interim statement, it is important to present the more descriptive, qualitative summaries now rather than wait for the more detailed analyses, and these are included in this report.

This chapter first treats the stratigraphy of the site on the basis of the 1977 excavations. Discussions and interpretations of the cultural remains follow in a format which includes the feature and artifact classes associated with each cultural component. An appendix describes the diagnostic chipped stone points from overburden removal.

STRATIGRAPHY

A full discussion of the stratigraphy of Phillips Spring is contingent upon further work (Chapter 14). The anatomy of the spring and its depositional characteristics complicate the stratigraphic record. In addition, the spring may be located on a terrace contact and the field on which it lies may be the result of two separate intervals of terrace aggradation (Chomko 1976:13). What is clear is that further excavation in the form of stratigraphic control blocks and extensive

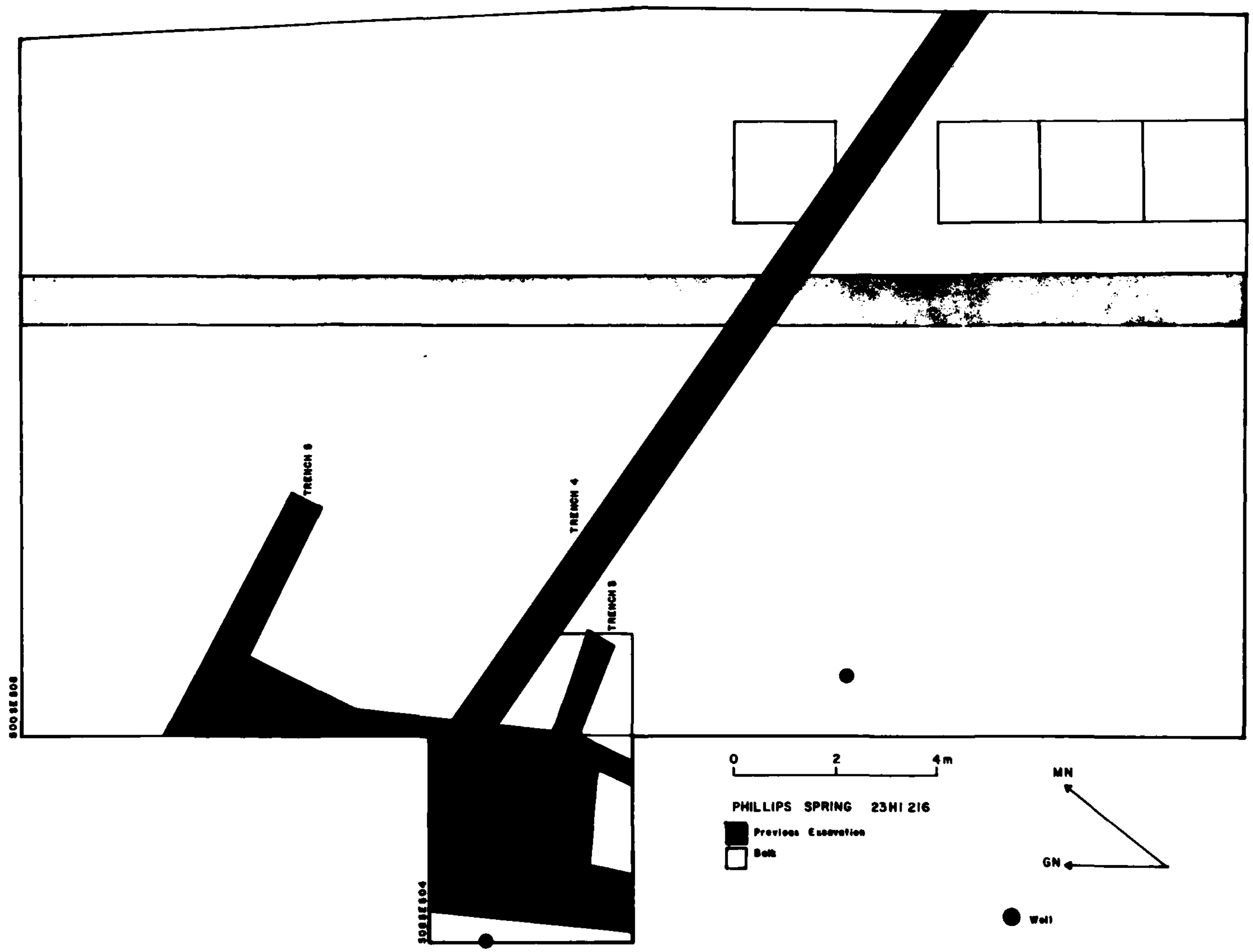

Figure 13.3. Summary of 1977 Excavations at Phillips Spring, Missouri.

Figure 13.4. Excavation of 1977 block. Note cross-sectioned pits and post molds, 50 cm grid on major rock concentrations at north end.

backhoe trenching through the site, from the present ground surface to bedrock, is required in order to provide a composite picture of the stratigraphy of the site, its relation to the spring and the evidence left by its aboriginal inhabitants.

Although a complete stratigraphic profile from Phillips Spring was not defined by the 1977 excavations, a series of critical observations were obtained from the south profile wall of Sq. 510SE508 (Fig. 13.5). The profile consists of four archaeological component floors effectively sealed from one another in a bluish gray, clayey silt matrix. An organic zone composed of highly concentrated uncharred organic debris and an area of ashy, sandy gray matrix are sandwiched between the two lowest archaeological components as separate stratigraphic units in the profile wall. Table 13.2 summarizes specific profile data. Two additional cultural zones were defined below the water line of Sq. 510SE508 in piston core samples.

The first of the archaeological components encountered is an as yet dated Sedalia complex (Seelen 1961; Chapman 1975:200-203) floor composed primarily of storage pits, post molds and extensive work areas. A tentative date of 3050±60 B.P. (SMU-238) is suggested from the 1974 excavations (Chomko 1976:23-24). This unit was the most extensively excavated during the 1977 field season, and charcoal samples have been submitted for dating.

A large rock-lined basin shaped pit defines a second separate component floor beneath the initial Sedalia complex floor. This pit was not only intersected in Sq. 510SE508, but also in both the 1976 backhoe trenches (Fig. 13.3). The feature probably exceeds sixty-four m^2, is layered with burned mussel shell, and has produced diagnostic Late Archaic artifacts of the Sedalia complex as well as seeds of squash and bottle gourd. Radiocarbon samples from trenches 4 and 5 date this feature at 3938±66 B.P. (SMU-419) and 3995±96 B.P. (SMU-423). A date of 3927±61 B.P. (SMU-319) was obtained from charcoal associated with squash seeds collected in 1974 from the wall of Trench 3 by Chomko. This date and Chomko's (1976:26) description of feature material indicated that he sampled this component rather than the next stratigraphic unit which also contained considerable evidence of tropical cultigens.

Thus, while Chomko (Chomko and Crawford 1978) is in error in correlating the earlier 1973 dates with squash seeds he recovered, we have confirmed that these dates correspond to the next component that has prolific evidence of tropical cucurbits. A radiocarbon date of 4222±57 B.P. (SMU-483), from charcoal collected from excavation of this component in Sq. 510SE508 is almost identical to the two 1973 dates of 4240±80 B.P. (SMU-102) and 4310±70 B.P. (SMU-98). As observed in profile (Fig. 13.5), the rock-lined basin shaped pit rests on top of and effectively seals this early cultigen horizon which consists of a roughly horizontal floor. Bottle gourd (*Lagenaria siceraria*) rind, seeds of bottle gourd, squash (*Cucurbita pepo*) and other taxa (Chapter 16) and wood digging implements were recovered from this component, labeled the Squash and Gourd Zone.

Correlation of this profile with Chomko's (1976:12-19) stratigraphic sequence indicates that the uppermost Sedalia complex floor falls into Stratum D. The rock-lined basin shaped pit, the Squash and Gourd Zone as well as the remainder of the observable profile appears to fall into

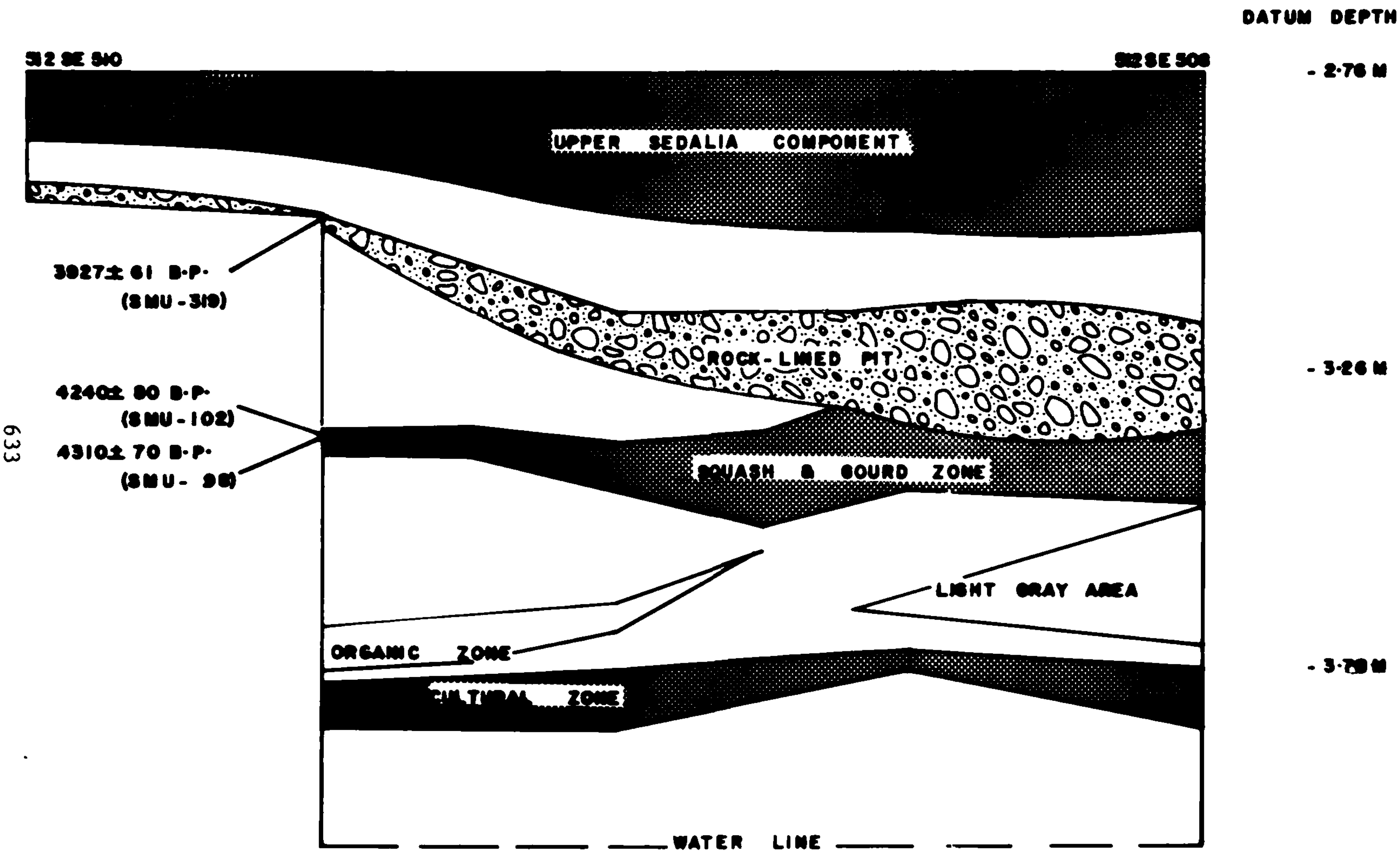

Figure 13.5. Schematic diagram of the south wall of the 2 m square 510SE508.

TABLE 13.2

Profile Descriptions

Datum Depth	Component	Color	Consistency	Texture	Structure	Remarks
2.76-2.96m	Upper Sedalia	very dark grey (10YR3/1)	sticky & plastic	clayey silt with sand	massive	
2.96-3.16m		slightly lighter than very dark gray (10YT3/1)	less sticky & plastic than previous unit	slightly siltier than previous unit	massive	
3.16-3.36m	2nd Sedalia	very dark grey (10YR3/1)	sticky & plastic	clayey silt with some sand	massive	rock-lined basin shaped pit feature: sediments exhibit a marked increase in charcoal
3.16-3.36m		very dark gray (10YR3/1)	sticky & plastic	sandier than previous unit with silt and some clay	massive	Sediments are lighter and sandier. An increase in uncharred organic debris, mottling of the sediments and sand was observed. Charcoal content decreases.
3 36-3.46m	Squash & Bottle Gourd Zone	dark gray (10YR4/1)	less sticky & plastic than previous units	very silty sand with some clay	massive	Very high uncharred wood content, vertebrate faunal preservation good
3.48-3.61m		very dark gray (2.5YR3/0)	plastic & less sticky	almost pure silt to the base	massive	

TABLE 13.2 (concluded).

Datum Depth	Component	Color	Consistency	Texture	Structure	Remarks
3.48-3.61m		dark grey (25YR4/0)	plastic but less sticky	sandy silt	crumbly	
3.46-3.96m		very dark gray (2.5YR3/0)	plastic and less sticky	increase in sand and silt especially just above water line	massive	Gastropods are present from 3.66-3.76 m. A large area of uncharred organic debris is present in the eastern side of the profile.
3.84m	Last visible cultural zone above the water line	very dark gray (2.5YR3/0)	plastic but not as sticky as the upper-most units	sandy silt	massive	High organic content with charcoal present.

Stratum C. Specifically, these units probably correlate with Stratum C_2 on the basis of soil color similarities and proximity to the spring itself. Chomko's stratigraphic units, however, should be viewed as preliminary and are subject to future revision.

THE UPPER SEDALIA COMPONENT FEATURES

Several comments should be made with respect to the feature descriptions. Grid locations are with reference to 2 m square excavation units. Botanical remains are quantified in Chapter 16. Vertebrate faunal preservation is generally poor. Most of the bone consists of unidentifiable, poorly preserved fragments. As a result, only the presence of bone is noted. Figure 13.6 schematically illustrates their horizontal distribution.

PIT FEATURES

A total of sixteen pit features were mapped in the Upper Sedalia component floor. Ten pits were partially or totally excavated. Lack of time and dewatering problems precluded excavation of the other six. Cross-sectional diagrams are summarized in Figure 13.7. Figure 13.8 shows representative pit types. Refer to Chapter 16 for discussion of botanical contents.

Excavated pit feature descriptions follow:

FEATURE 392
Grid location: 514SE508, 512SE508
Shape: Overall: Irregular
Interior walls: Not further modified
Dimensions:
Maximum length: 1.4 m E-W
Maximum width: 1.12 m N-S
Maximum depth: 0.22 m (d.d. 2.77-3.05)
Matrix characteristics:
Surrounding pit matrix is a dark gray (10YR4/1) silty, clayey loam. Pit fill is a uniform, very dark gray (10YR3/1) silty, clayey loam. Rodent disturbance is present at the base of the pit.
Contents:
Artifactual: Waste flakes
Natural Rock: Burned and unburned dolomite, quartzite, oolitic Jefferson City chert, banded and cross banded Jefferson City chert, cotton rock.
Associated features:
Post molds 1091, 1092, 1093, and 1094 were exposed at 2.88 m in the western half of the pit. All four terminated at 2.98 m.
Reference illustrations:
Profiles: Figure 13.7a.

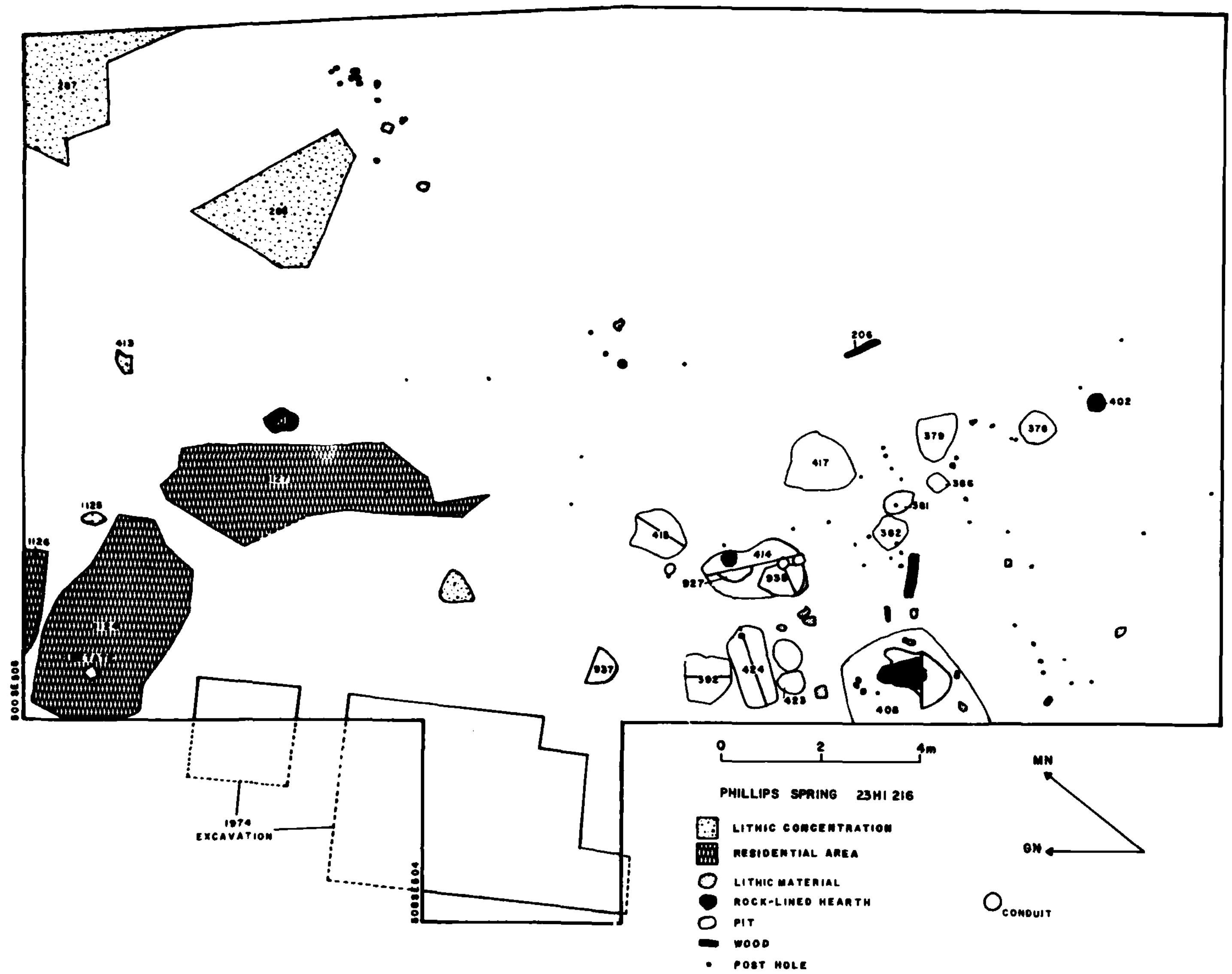

Figure 13.6. Schematic diagram of major features, Upper Sedalia component.

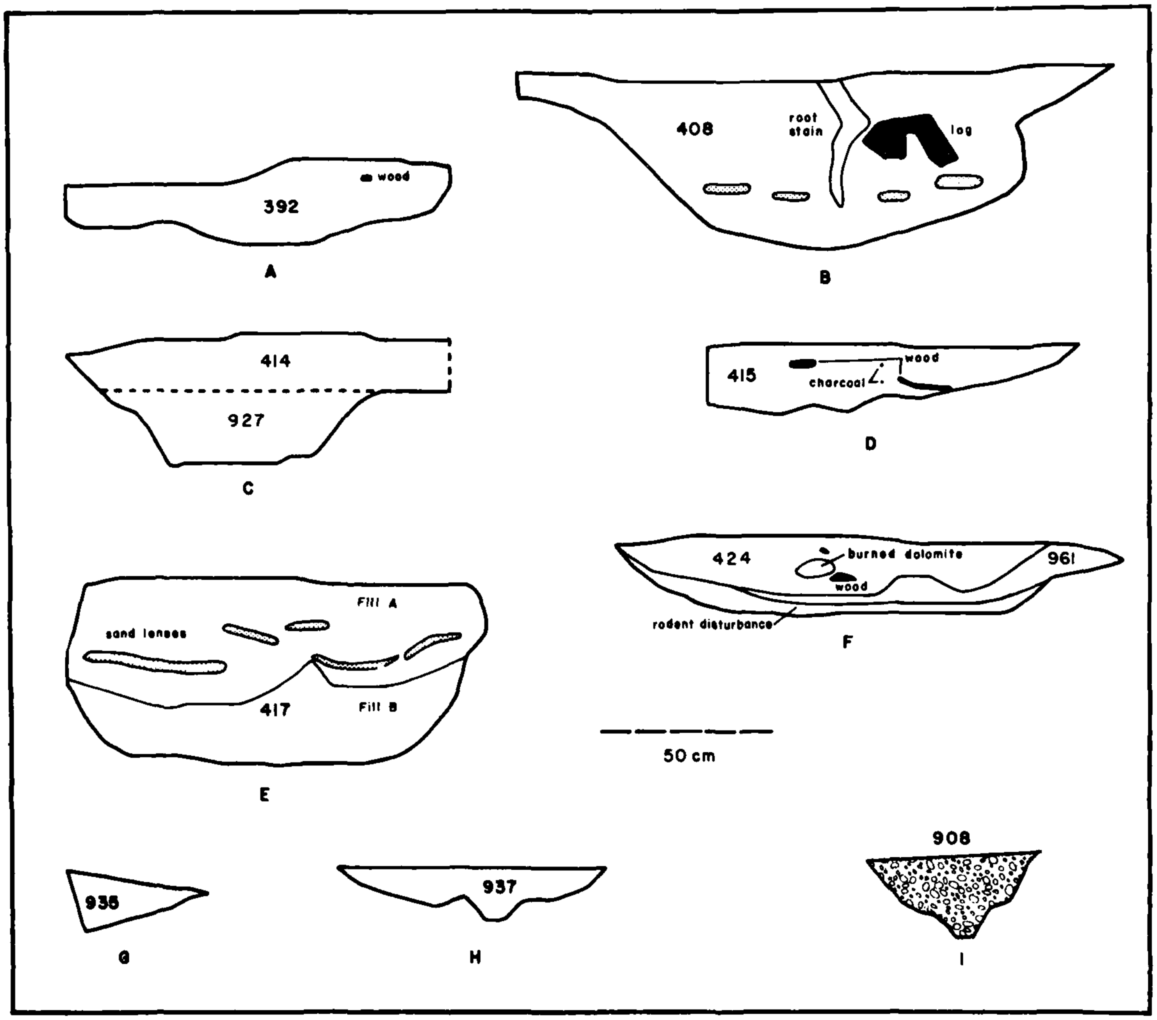

Figure 13.7. Pit and hearth feature cross sections.

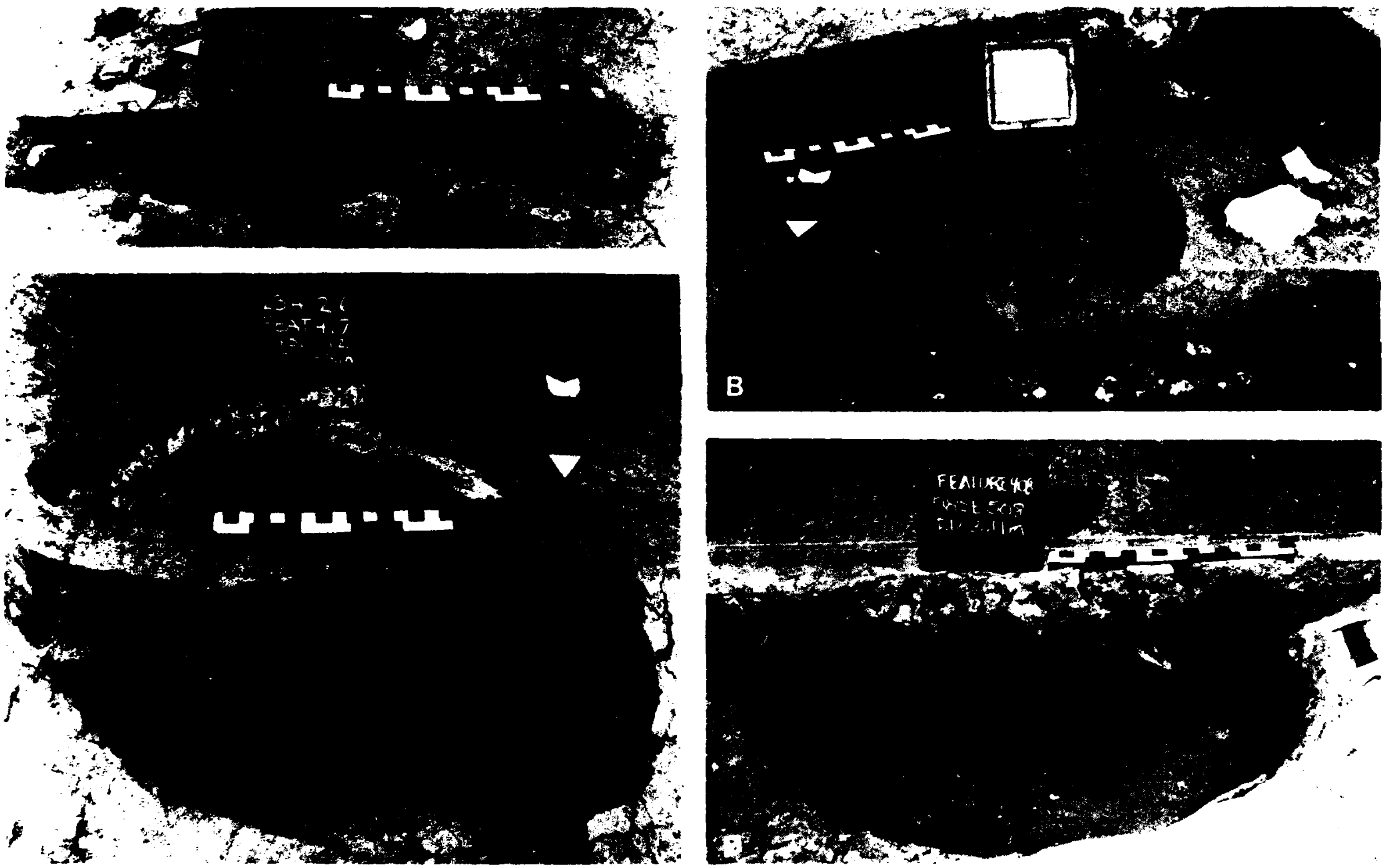

Figure 13.8. Excavated pits: a-b, shallow basin shaped pits; c-d, deep cauldron shaped pits. Note sand lens at base of a; cut wood in d; sand lenses in c.

FEATURE 408

Grid location: 518SE508, 516SE508

Shape: Overall: Generally sub-rectangular. Initial pit contracts into a much smaller, oval pit at 2.70 m.

Interior walls: Larger pit walls are not further modified. A large wood fragment obscured the northern side of the smaller pit. The southern half which was excavated to the base of the pit exhibited bell-shaped walls.

Dimensions:

Larger pit:
Maximum length: 2.80 m N-S
Maximum width: 1.90 m E-W
Maximum depth: 0.10 m (d.d. 2.60-2.70)

Smaller pit:
Maximum length: 1.58 m N-S
Maximum width: 1.19 m E-W
Maximum depth: 0.41 m (d.d. 2.70-3.11) in the southern half of the pit

Matrix characteristics:

Matrix surrounding both pits is a dark gray (10YR/1), silty, clayey loam. Fill in both pits is generally very dark gray (10YR3/1), silty, clayey loam. Fill in the base of the southern half of the smaller pit is mottled with light gray areas.

Contents:

Bone
Artifactual: Waste flakes, 2 bifaces
Natural rock: sandstone, dolomite, and river gravel

Associated features:

Possible post molds 879-894, 900-904, 906-911 at 2.70-2.80 m present in both pits.

Reference illustrations:

Profiles: Figure 13.7b.

FEATURE 414

Grid location: 512SE510, 514SE510

Shape: Overall: Oval
Interior Walls: Not further modified

Dimensions:

Maximum length: 1.95 m N-S
Maximum width: 1.27 m E-W
Maximum depth: 0.16 m (d.d. 2.72-2.88 m)

Matrix characteristics:

Pit matrix is generally a very dark gray (10YR3/1) silty, clayey loam.

Contents:

Natural rock: Quartzite, banded Jefferson City chert, dolomite, sandstone

Associated features:

The area encompassed by pit feature 414 appears to have been remodeled or modified several times (Fig. 13.9). Feature 414

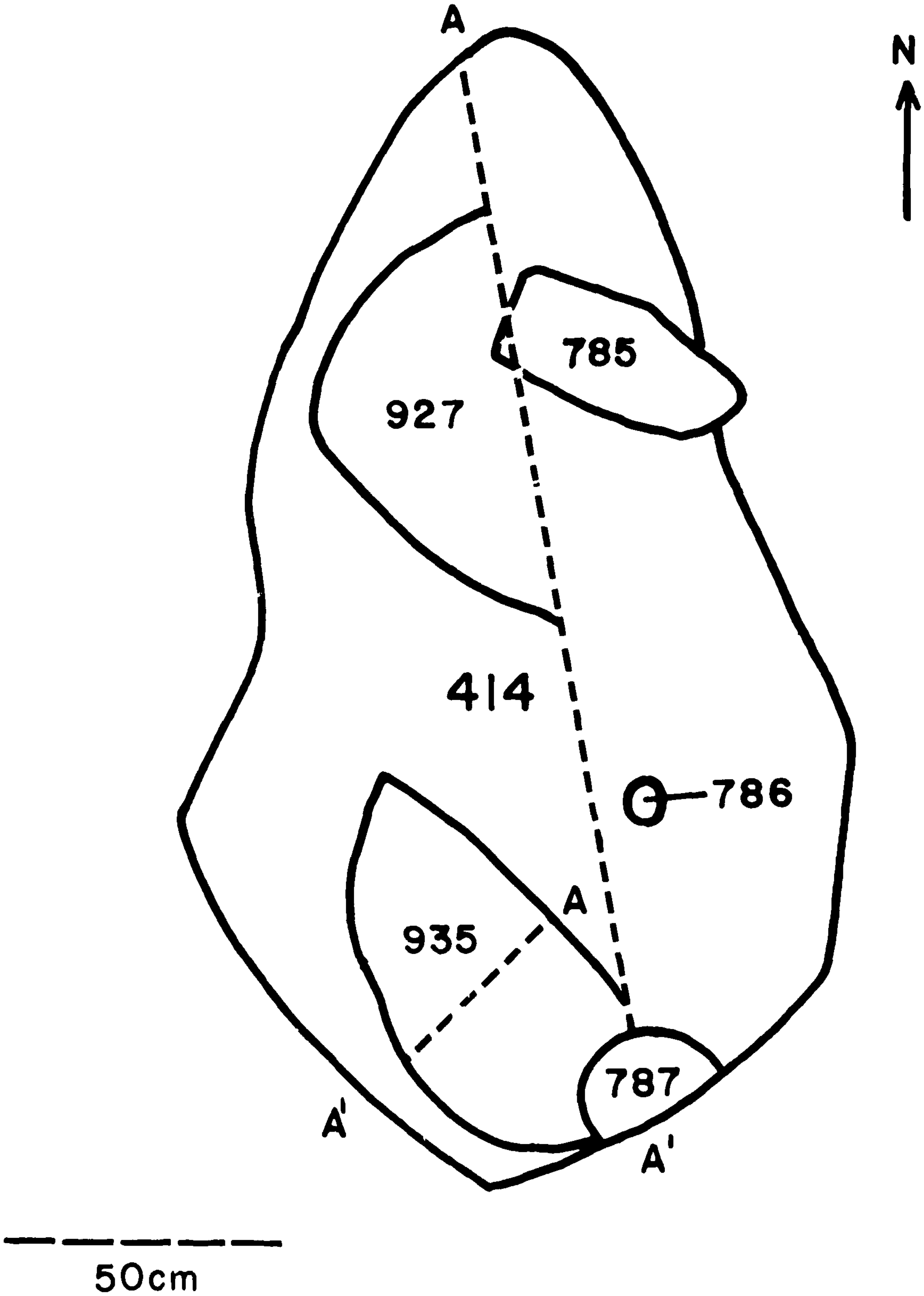

Figure 13.9. Detail of area encompassed by Feature 414.

contained three large post molds, 785 (excavated), 786 and 787 (unexcavated). Another smaller pit, 927, was excavated in the northwest half of pit feature 414. This smaller pit (927) appears to have been constructed prior to 414. Finally, another irregularly shaped pit (935) was excavated in the southwestern end of pit feature 414.

Reference illustrations: Profiles: Figure 13.7c.

FEATURE 415

Grid location: 512SE510, 512SE512

Shape: Overall: Irregular

Interior walls: Not further modified

Dimensions:

Maximum length: 1.45 m NE-SW

Maximum width: 0.96 m NW-SE

Maximum depth: 0.20 m (d.d. 2.80-3.00 m)

Matrix characteristics:

Pit fill is a uniform very dark gray (10YR3/1) silty, clayey loam.

Contents:

Artifactual: Waste flakes

Natural rock: Quartzite, banded Jefferson City chert, sandstone, dolomite

Associated features: None

Reference illustrations: Profiles: Figure 13.7d.

FEATURE 417

Grid location: 514SE512, 516SE512

Shape: Overall: Circular

Interior walls: Bell-shaped

Dimensions:

Maximum length: 1.20 m E-W

Maximum width: 1.15 m N-S

Maximum depth: 0.555 m (d.d. 2.75-3.305 m) in the northern half

Matrix characteristics:

Pit fill ranges from a very dark gray (10YR3/1) to black (10YR2/1) silty, clayey loam in the first 20 cm. The second 20 cm range from dark gray (10YR4/1) to a very dark gray (10YR3/1) with scattered gray (10YR5/1) and yellowish-red (5YR5/8) mottling. The last 15 cm range from a very dark gray (10YR3/1) to a gray (10YR4/1) at the very base of the pit. Pit matrix is generally a silty, clayey loam. Sand lenses and mottling are interspersed in the first 25 cm of the pit matrix.

Contents:

Artifactual: Waste flakes

Natural rock: Oolitic Jefferson City chert, banded Jefferson City chert, sandstone

Associated features: None

Reference illustrations: Profiles: Figure 13.7e.

FEATURE 424

Grid location: 514SE508

Shape: Overall: Sub-rectangular

Interior walls: Not further modified

Dimensions:

Maximum length: 1.44 m NE-SW

Maximum width: 0.66 m NW-SE

Maximum depth: 0.195 m (d.d. 2.78-2.975)

Matrix characteristics:

Pit fill is a dark gray (10YR4/1) silty clayey loam in the first 0.13 m. The lower part of the pit (0.065 m) consisted of a light gray (10YR7/1) sand lens. Extensive rodent activity in the bottom of this feature obscured part of the contact with pit feature 961.

Contents:

Artifactual: Waste flakes

Natural Rock: Quartzite, oolitic Jefferson City chert, banded Jefferson City chert, dolomite, sandstone

Associated features:

Feature 424 intrudes into another pit feature 961. Six possible post molds were located in the unexcavated southern half of feature 424.

Reference illustrations: Profiles: Figure 13.7f

FEATURE 927

Grid location: 512SE510, 514SE510

Shape: Overall: Semi-circular

Interior walls: Not further modified

Dimensions:

Maximum length: 0.68 m N-S

Maximum width: 0.35 m E-W

Maximum depth: 0.20 m (d.d. 2.88-3.08)

Matrix characteristics:

Pit fill is a uniform very dark gray (10YR3/1) silty, clayey loam.

Contents:

Artifactual: Projectile point

Natural Rock: Quartzite, cross banded Jefferson City chert, dolomite, sandstone, cotton rock

Associated features:

Pit feature 927 is the first feature built in a series of features encompassed by pit feature 414. Besides feature 414, feature 927 is also associated with pit feature 935 and post molds 785, 786 and 787.

Reference illustrations: Profiles: Figure 13.7c

FEATURE 935

Grid location: 514SE510

Shape: Overall: Irregular

Interior walls: Not further modified

Dimensions:

Maximum length: 0.66 m NW-SE

Maximum width: 0.47 m NE-SW
Maximum depth: 0.225 m (d.d. 2.75-2.995 eastern half)

Matrix characteristics:

The first 10 cm excavated consisted of a very dark gray (10YR 3/1) silty, clayey loam with a lamination of burned, mixed soil (grayish brown 10YR5/2) which extended from 0.5 to 1.5 cm in depth. At the base of the first 10 cm level, this laminated area was sand lined. In the second 10 cm, the matrix was a very dark gray (10YR3/1) silty clayey loam with a gray (10YR5/1) sand lens in the southern end. The last 0.045 cm of matrix in the eastern half of this pit was a black (10YR2/1) clay.

Contents:

Natural Rock: Quartzite, oolitic Jefferson City chert, dolomite, sandstone

Associated Features:

Feature 935 is located within the south-western boundary of Feature 414, a long, shallow pit. It appears to be an intrusive modification of Feature 414 as opposed to pit Feature 927 which is associated and is the original pit in the series. A possible post mold, 1032, was observed in the base of Feature 935. Three other post molds are also associated with the Feature 414 complex of Features 785, 786 and 787.

Reference illustrations: Profiles: Figure 13.7g

FEATURE 937

Grid location: 510SE508

Shape: Overall: Circular
Interior walls: No further modification

Dimensions:
Maximum length: 1.65 m E-W
Maximum width: 0.58 m N-S
Maximum depth: 0.145 m (d.d. 3.05-3.195)

Matrix characteristics:

Pit matrix is a uniform very dark gray (10YR3/1) silty, clayey loam.

Contents:

Bone
Artifactual: Hematite
Natural Rock: Quartzite, oolitic Jefferson City chert, banded Jefferson City chert, dolomite, sandstone

Associated Features:

Possible post molds 1109 - 1118

Reference illustrations: Profiles: Figure 13.7h

FEATURE 961

Grid location: 514SE508

Shape: Overall: Irregular
Interior walls: Not further modified

Dimensions (only the northern half excavated):
Maximum length: 1.125 m E-W
Maximum width: 0.50 m N-S
Maximum depth: 0.16 m (d.d. 2.84-3.00)

Matrix characteristics:

Pit fill is a uniform dark gray (10YR4/1) silty, clayey loam. The bottom of the pit was disturbed by rodent burrows. Matrix surrounding the pit is a dark gray (10YR4/1) silty, clayey loam.

Associated features:

Pit feature 424 intrudes into pit 961, which is the older of the two. Pit feature 961 was originally manifested as a dark stain on the surface of feature 424. After excavation and cross sectioning, pit 424 could be separated into two features. Feature 96 was a dark gray (10YR4/1) matrix. A sand lens sealed the base of feature 424 which intruded into feature 961. The fill of feature 424 was a very dark gray (10YR3/1) matrix.

Reference illustrations: Profiles: Figure 13.7f

Unexcavated pit features are listed in Table 13.3.

TABLE 13.3

Unexcavated Pit Features

Feature	Grid Location	Surface Shape	Dimensions Max Length	Max width
378	520SE512	Semi-circular	0.75 m N-S	0.75 m E-W
379	516SE512 518SE512	Sub-triangular	1.00 m NW-SE	0.80 m NE-SW
380	518SE512	Square	0.45 m N-S	0.40 m E-W
381	516SE512	Oval	0.65 m NW-SE	0.45 m NE-SW
382	516SE512 516SE510	Semi-circular	0.70 m N-S	0.70 m E-W
383	516SE510	Irregular	1.00 m NW-SE	1.00 m NE-SW

SUMMARY OF PIT FEATURES

All of the sixteen pit features in the upper Sedalia component are localized in the southwestern end of the 1977 excavation block near the spring conduit (Fig. 13.6). This constellation of pit features composes a complex but spatially distinct activity area across the site.

Of the ten excavated pits, only two showed specific modification of the interior walls. The remainder of these pits have been merely scooped out of the surrounding matrix. All but two of the excavated pits were associated with other features in the form of post molds and additional pits. Table 13.4 summarizes the excavated pits and the other features with which they were associated.

Eight of the ten excavated pits appear to have been subject to remodeling at one time or another. The extensive remodeling that took place in some pits can be relatively dated based on the sequence of construction. It is hoped that the series of samples that have been sub-

TABLE 13.4

Summary of Excavated Pit Features Associated with Additional Features from the Upper Sedalia Component

	Pit Number									
Feature Type	392	408	414	415	417	424	927	935	937	961
Post molds	X		X				X	X		
Possible post molds		X	X			X	X	X	X	
Additional pits		X	X			X	X	X		

mitted for radiocarbon dating will shed some light on the absolute sequence of construction and remodeling. However, there will be a limit to the information that radiocarbon dates will be able to provide in this sense. Radiocarbon dating probably cannot be "fine tuned" to an exact year-by-year sequence possible with dendrochronology. This may be an eventuality in the lower Pomme de Terre Valley, provided the proper reference sequences for techniques such as dendrochronology or archaeomagnetism can be set for the study locality. What is apparent from the relative sequences observed in the construction and remodeling of the excavated pits is that these pits were probably used for more than a single season. Whether the inhabitants of Phillips Spring ultimately used the pits on a year-round basis or seasonally for a number of years remains unclear.

Table 13.5 summarizes the contents removed from the excavated pits in the Upper Sedalia component. All but two of the excavated pits contained botanical remains that could have served as food (Chapter 16). Of particular interest are the two pits that produced seeds of the cultigen squash. It is not unreasonable to assume that the pits were used to store food stuffs in order to protect them from the elements. Faunal material may also have been stored in these pits although the frequency of bone debris is low. Artifactual debris is also present in these pits in small amounts. Of note are the presence of a single projectile point in one pit and two bifaces in another. Whether these items were actually stored in the pits or were discarded into pits that had ceased to serve as storage facilities, is still unclear. The unmodified rock debris from the pits is being analyzed and will be compared with other component features to see if significant differences exist in feature fill.

Additional stratigraphic information was obtained from excavation of the pits in the Upper Sedalia Component. Three of these features exhibited sand lenses in the pit fill which may have related to periodic high levels of spring discharge.

EXTENSIVE ROCK FEATURES

Four large areas of concentrated lithic debris were excavated in the northern end of the excavation block. Two were not completely excavated because they extend into the north wall of the excavation block. Extensive

TABLE 13.5

Summary of Excavated Pit Feature Contents from the Upper Sedalia Component

	Pit Number									
Pit Contents	392	408	414	415	417	424	927	935	937	961
Botanical										
Cultigens	X			X						
Plants Used Aboriginally For Food	X	X		X	X	X	X	X		X
Annuals							X			
Spring Plants										
Weeds and Disturbance Plants	X	X			X		X	X		X
Nuts	X	X		X	X	X	X	X		X
Wood	X	X				X		X		
Faunal	X	X				X			X	
Artifactual										
Projectiles							X			
Bifaces		X								
Hematite									X	
Waste flakes	X	X		X	X	X				
Natural rock	X	X	X	X	X	X	X	X	X	

rock feature descriptions follow:

FEATURE 287: Chert heat treatment station

Grid location: 500SE520, 502SE520

General description:

Feature 287 was exposed in two increments (d.d. 2.45 and 2.65) during overburden clearance. The feature as a whole consists of a rock mat composed of highly oxidized rock debris concentrated over an extensive area in the northeastern corner of the excavation block. Cultural material associated with the feature includes three cores and several waste flakes, most of which appear to be heat treated. The highly oxidized contents of this feature suggest the area may have been a lithic heat treatment station.

Overall shape: Irregular

Dimensions:

Maximum length: 1.35 m NW-SE
Maximum width: 0.34 m NE-SW
Maximum depth: 0.20 m (d.d. 2.45-2.65)

Matrix characteristics:

Feature matrix is a brown-dark brown (10YR4/3) silty, clayey loam

mottled with dark grayish brown (10YR4/2) veins. Manganese stains were present in trace amounts. No apparent staining of matrix through oxidation.

Contents:

Artifactual: Three cores, four fragments of ground stone, waste flakes, thermally fractured chert

Unmodified rock: Jefferson City oolitic chert, Jefferson City banded chert, burned and unburned quartzite, burned and unburned sandstone

Associated features: None

Reference illustrations: Photographs: Figure 13.10

Feature 287 was badly damaged by rain preventing total mapping and flotation procedures.

FEATURE 1124: Domestic floor or residential area

Grid location: 500SE508, 500SE510, 500SE512, 502SE508, 502SE510, 502SE 512

General description:

Feature 1124 encompanses most of the 2 m square units 500SE508, 500SE510, 502SE508, 502SE510 and minute areas of 500SE512 and 502 SE512 in the northwest corner of the excavation block.

The feature floor is oriented to grid northwest and consists of densely concentrated, unmodified rock debris, debitage, chipped and ground stone tools. Several possible post molds were located on the northern and western perimeters of Feature 1124 suggesting that the area may have been walled and/or roofed at one time.

The contents and distribution of Feature 1124 suggest a Late Archaic work area used for producing chipped stone tools that may also have been surrounded by a walled and/or roofed structure.

Overall shape: Oblong to roughly rectangular

Dimensions:

Maximum length: 4.30 m NW-SE

Maximum width: 2.40 m NE-SW

Maximum depth: 0.04 m (d.d. 2.78-2.82+). Evidence of another possible floor below Feature 1124 was noted, but excavations were not conducted below 2.82 m.

Matrix characteristics:

Fill above the feature floor was yellowish brown (10YR5/6) in color with notably less rock debris. The feature floor fill is a grayish-brown (10YR5/2) to dark gray (10YR3/1) silt. The surrounding matrix is generally a yellowish-brown (10YR5/6) clayey silt. The feature floor appears oxidized. Preservation of floral and faunal material is very poor.

Contents:

Bone

Artifactual: Eleven chipped stone points, twelve bifaces, nine cores, one anvil, five fragments of hematite, waste flakes, thermally fractured chert

Natural rock: Quartzite, oolitic Jefferson City chert, banded Jefferson City chert, burned and unburned dolomite and sandstone

Associated features:

Figure 13.10. Feature 287 in the northwest corner of the excavation block. Matrix includes slabs of burned sandstone, fire-cracked chert and chert artifacts and feature is probably a heat treatment facility.

Possible post molds 940-948 located on the northern and western peripheries of this feature floor. Feature 1124 is part of a complex of extensive rock features (1126 and 1127) located in the northwestern end of the excavation block.

Reference illustrations: Photomap: Figure 13.11.

FEATURE 1126

Grid location: 500SE508, 500SE570

General description:

Feature 1126 consists of a dense concentration of natural rock debris, debitage, chipped and ground stone tools. Although there were no associated possible post molds apparent, and Feature 1126 was not fully excavated, it is very similar in nature to Feature 1124 which lies directly south. It appears to be another domestic floor which had been intensively used for production of stone tools.

Overall shape:

Apparently rectangular. Only the southern end of the feature was observable. The remainder continues beyond the northern wall of the excavation block.

Dimensions:

Maximum length: 2.10+ m E-W
Maximum width: 0.50+ m N-S
Maximum depth: 0.04 m (d.d. 2.78-2.82)

Matrix characteristics:

Fill above the feature floor was yellowish-brown (10YR5/6) in color with notably less rock debris. The feature floor fill varied from a dark grayish brown (10YR4/2) to a very dark gray (10YR3/1) silt with dark yellowish-brown (qoYR4/4) to yellowish-brown (10YR5/6) mottling. The surrounding matrix is more clay-like. Floral and faunal preservation is generally poor.

Contents:

Artifactual: One fragment of ground stone, two cores, waste flakes, thermally fractured chert

Natural rock: Quartzite, oolitic Jefferson City chert, banded Jefferson City chert, burned and unburned dolomite and sandstone

Associated features:

Feature 1126 is part of a larger feature complex including extensive rock features 1124 and 1127 located in the northwestern corner of the excavation block.

Reference illustrations: Photomap: Figure 13.11

FEATURE 1127: Domestic floor or residential area

Grid location: 500SE510, 502SE512, 504SE510, 504SE512, 506SE512, 508 SE512

General description:

Feature 1127 consists of a large but scattered concentration of natural rock debris, debitage, chipped and ground stone. Feature 1127 differs from the other extensive rock features in the vicinity in that the distribution of rock debris is not as dense although it is composed of much the same type of lithic debris classes and is associated with a rock-lined hearth.

Figure 13.11. Photomosaic of Features 1124 and 1126. Feature 1126 upper left.

Overall shape: Elongated but irregular
Dimensions:
Maximum length: 6.55 m N-S
Maximum width: 2.00 m E-W
Maximum depth: 0.10 m (d.d. 2.72-2.82)
Matrix characteristics:
Feature floor matrix spans a very dark grayish brown (10YR3/2) to a very dark brown (10YR3/1) with small areas of black to very dark brown (10YR2.5/1) clay. The clayey nature of the matrix was interspersed with small amounts of sand and silt. The matrix was mottled with a strong brown (7.5 YR4/6 and 7.5YR5/8) and yellowish to dark yellowish brown (10YR3/6 to 10YR5/6). Floral and faunal preservation is generally very poor.
Contents:
Artifactual: Three bifaces, one fragment ground stone, waste flakes, thermally fractured chert
Natural rock: Quartzite, Oolitic Jefferson City chert
Associated features:
Feature 1127 is part of an extensive rock feature complex in the northwestern end of the excavation block. Feature 1127 is associated with a rock lined hearth (908).
Reference illustrations: Figure 13.12

SUMMARY OF EXTENSIVE ROCK FEATURES

The extensive rock features are localized to the northern end of the 1977 excavation block (Fig. 13.6), a spatially distinct activity area dichotomized from the storage pits near the spring. Table 13.6 summarizes their contents. One of these features is tentatively identified as a heat treatment station based on the high frequency of burned natural rock associated with a small number of thermally treated cores and flakes.

TABLE 13.6

Summary of Extensive Rock Feature Contents from the Upper Sedalia Component

	Feature Number			
Contents	287	1124	1126	1127
Botanical		X		
Faunal		X		
Artifactual				
Projectiles		X		
Bifaces		X		X
Cores	X	X	X	
Ground stone	X	X	X	X
Waste flakes	X	X	X	X
Hematite		X		
Thermally fractured chert	X	X	X	X
Natural rock	X	X	X	X

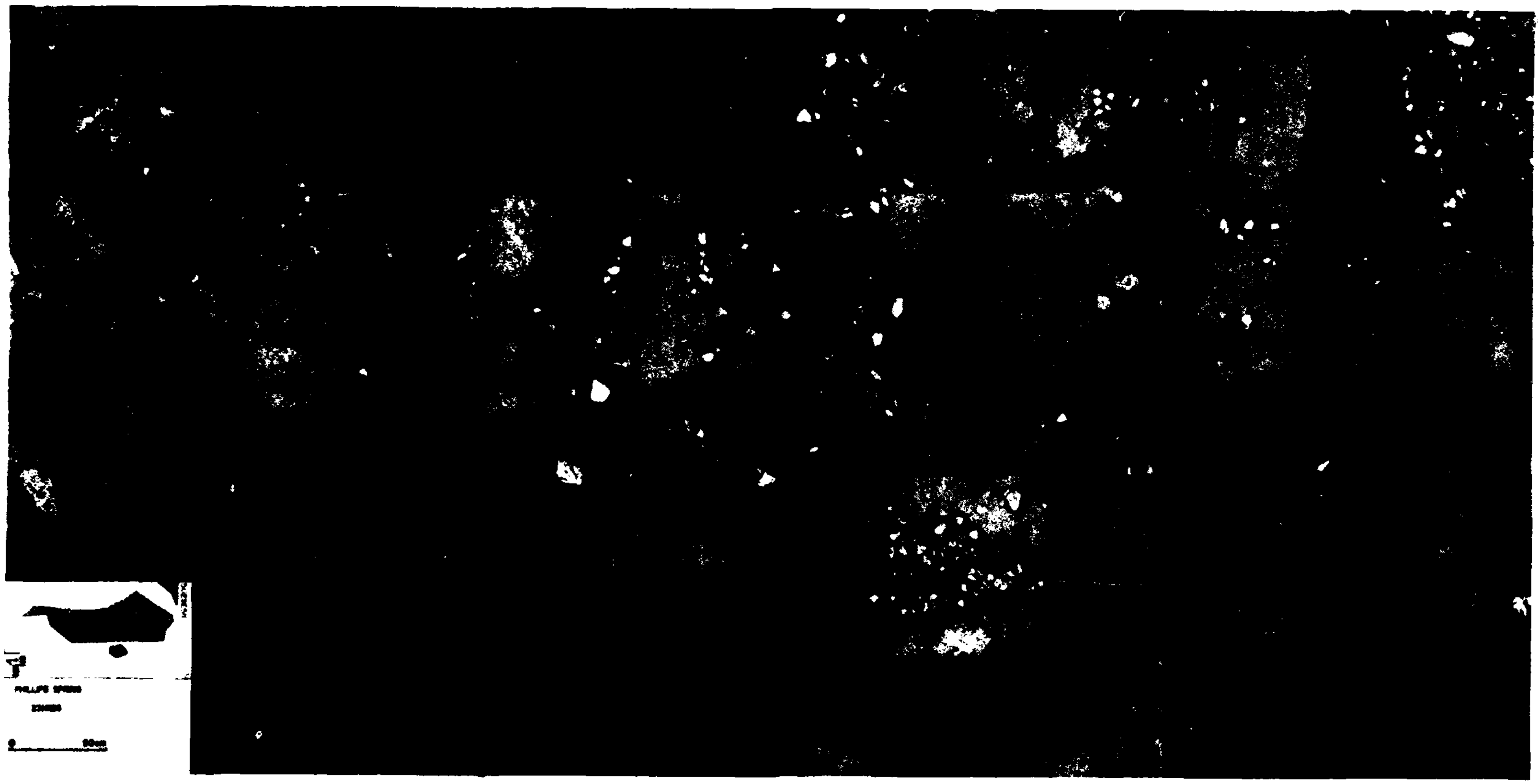

Figure 13.12. Photomosaic of Feature 1127, a domestic floor and associated hearth, Feature 908.

The other three extensive rock features are more complex. The presence of heat treated lithic debris in these features suggests that heat treatment may have taken place. However, finished tools, preforms, other tools associated with flint knapping and debitage indicate that the range of activities is wider in scope. Activities in these areas probably include reduction of lithic materials to final production of chipped stone tools. It is significant that all but one of the chipped stone points are associated with one of these features (1124); that another has an associated hearth (1127) and that charred bone fragments are common. There is problematic evidence that one of the work areas may have been associated with a structure. The overall, elongated shape of at least two of these features is also suggestive of spatial patterning or some sort of structure. The unmodified rock and artifactual debris from the extensive rock features are undergoing additional analysis. Our tentative conclusion is that these represent domestic or residential loci.

ROCK LINED HEARTH

FEATURE 908

Grid location: 504SE512, 504SE514

General description:

Feature 908 is a basin shaped hearth filled with fire cracked rock and charcoal. The top of the basin was covered with rock debris which extended beyond the limits of the basin itself. The feature was defined on the basis of the distribution of the rock debris and charcoal both vertically and horizontally.

Overall shape: Oval

Dimensions:

Maximum length: 0.80 m N-S
Maximum width: 0.56 m E-W
Maximum depth: 0.335 m (d.d. 2.685-3.02)

Matrix characteristics:

Hearth matrix is a uniform very dark gray (10YR3/1) compact clay with strong brown (7.5YR5/8) to yellowish brown (10YR5/8) mottling.

Contents:

Artifactual: Thermally fractured chert
Natural rock: Quartzite, oolitic Jefferson City chert, banded Jefferson City chert, burned and unburned dolomite and sandstone

Associated features:

Feature 1127, an extensive rock feature lies directly to the west

Reference illustrations: Figure 13.7i

POST FEATURES

A total of 419 possible post or post molds were investigated in the Upper Sedalia component. Initially, each possible post feature was defined as an approximately circular discoloration or standing wood fragment which appeared on the floor after it was troweled. Each possible post was then tagged and catalogued prior to cross sectioning. On the basis of each exposed cross section, the individual stains were evaluated

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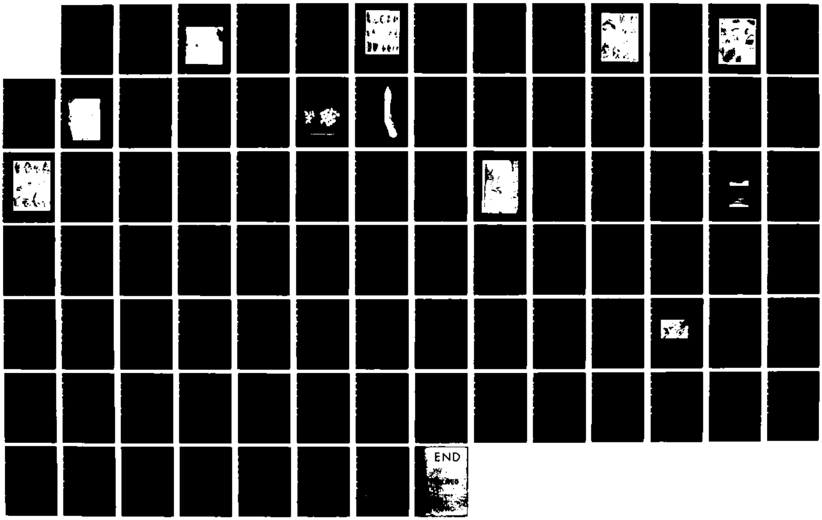

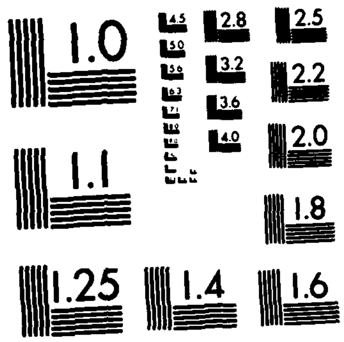

MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

using these criteria: (1) The presence of wood or a dark soil discoloration with approximately straight sides; (2) a rounded or tapered base; (3) the absence of rootlets or other plant structures, either with plant tissue remaining or represented as a soil discoloration, which would indicate a living plant rather than a piece of purposefully shaped wood.

Of the 419 possible posts cross sectioned, fifty-four (13%) are classified as actual post features. Five (9%) still contained part of the original post either in a charred or uncharred form. Another ninety (21%) possible post molds are problematical either because they occurred in the fill of pit features and could not effectively be cross sectioned, or, because they required re-sectioning, which could not be done due to time limitations.

The majority of actual post features concentrate near the storage pits but specific post patterns remain ambiguous (Fig. 13.6). Post size is differential in the Upper Sedalia component. Six average twenty-five cm in diameter while the remaining posts or post molds are considerably smaller (6 cm) in average diameter. This size difference possibly reflects the function of the larger posts as main supports, with the smaller posts being less substantial leaners or supplemental wall supports. Figure 13.13 illustrates one of the larger posts. The basal end of the post is cut but is otherwise unmodified; however, in cross section, many of the other post molds are tapered or blunted at the base indicating they have been carefully shaped prior to placement. A single post mold (CN641) has small rock wedges apparently set in the post hole to secure a loose post. None of the posts appears to have been pulled.

The remaining 275 possible post molds cross sectioned were classified as rodent burrows, roots, stains not visible in cross section and unidentifiable areas of differential soil mottling. Of particular interest are the last two classes because after all of the possible post molds had been cross sectioned, 'simulated' post molds were observed as the floor began to dry after a failure in the dewatering system. Small, circular areas of soil discoloration began forming, particularly in the 1976 backhoe trenches, which were identical in appearance to the 419 specimens that had been previously tested. This phenomenon is probably related to differential drying of the spring sediments and may explain the high proportion of the 419 possible post molds where the original discoloration could not be observed in cross section (150 or 36%), or were areas of differential soil mottling (25 or 6%). In any case, it is clear that cross sections are necessary to define posts.

MISCELLANEOUS FEATURES

Miscellaneous features include 23 small lithic concentrations, or unidentified charcoal and rock concentrations and a tree stump. With the exception of small lithic concentrations, the miscellaneous feature types are described individually. Two representative examples of the small lithic concentrations follow:

FEATURE 969: Small lithic concentration
Grid location: 510SE514
General description:
Consists of two concentrations of Jefferson City banded chert

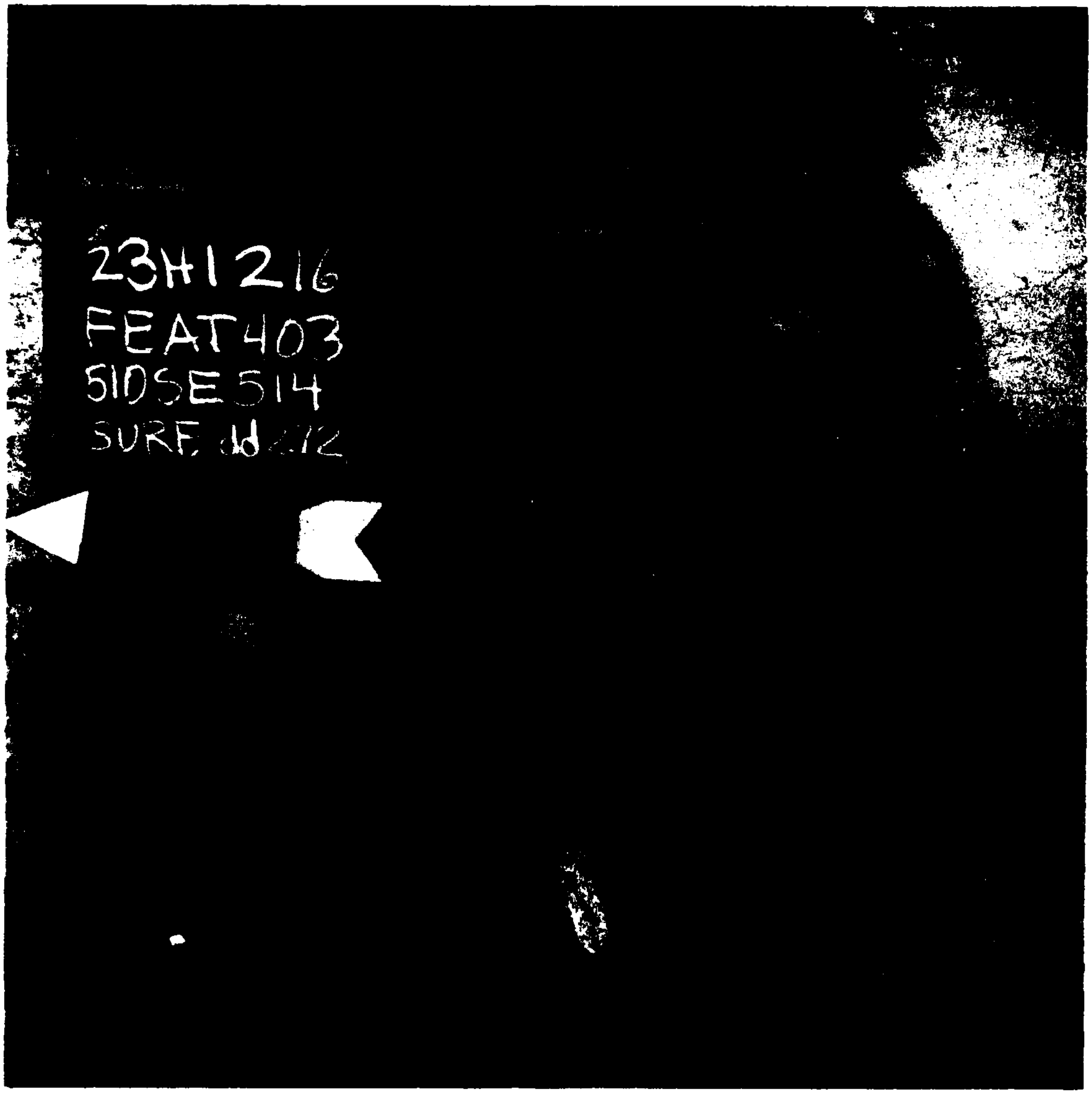

Figure 13.13. Post 403 in cross section.

debris. The concentrations seem to be untreated natural rock debris that is from the same parent rock.

Overall shape: Irregular

Dimensions:

Maximum length: Area A - 0.07 m N-S
Area B - 0.16 m E-W

Maximum width: Area A - 0.05 m E-W
Area B - 0.13 m N-S

Maximum depth: Both Areas A & B - 0.05 m (d.d. 2.635-2.685)

Matrix characteristics:

Surrounding matrix is a very dark gray (10YR3/1) silty, clayey loam with yellowish brown (10YR5/6) mottling.

FEATURE 1125: Small lithic concentration

Grid location: 500SE510, 500SE512

General description:

Consists of a small concentration of unmodified rock debris, waste flakes and thermally fractured chert. This rock concentration is considerably smaller than the adjacent feature floors 1124, 1126, and 1127. Feature 1125 may be an appendage of Feature 1124, the largest of the extensive rock features.

Overall shape: Oval

Dimensions:

Maximum length: 0.55 m N-S
Maximum width: 0.20 m E-W
Maximum depth: 0.04 m (d.d. 2.78-2.82)

Matrix characteristics:

Feature matrix is a dark grayish brown (10YR4/2) silty, clayey loam mottled with dark, yellowish brown (10YR4/4). Feature matrix appears oxidized.

Contents:

Artifactual: Waste flakes and thermally fractured chert
Natural rock: Quartzite, oolitic Jefferson City chert, banded Jefferson City chert

Associated features:

Feature 1125 is a small rock concentration which is part of a large extensive rock feature complex composed of Features 1124, 1126 and 1127. This small oval may be a satellite of the largest of the extensive rock features, 1124.

FEATURE 413: Unidentified charcoal and rock concentration

Grid location: 500SE514, 502SE514

General description:

Consists of a concentration of charcoal and four fist-sized sandstone and dolomite cobbles that are badly weathered.

Overall shape: Irregular

Dimensions:

Maximum length: 0.62 m N-S
Maximum width: 0.41 m E-W
Maximum depth: 0.16 m (d.d. 2.42-2.75)

Matrix characteristics:

Sediments are a dark grayish brown (10YR4/2) silty, clayey loam

with a dark yellowish brown (10YR4/4) mottling.

FEATURE 402: Tree stump
Grid location: 520SE514
General description:
Classified as a tree stump on the basis of its cross section which revealed a series of rootlets radiating from the wood, originally thought to be a post. It is included as an illustration of natural phenomenon initially thought to be culturally related.
Dimensions:
Maximum diameter: 0.13 m
Maximum depth: 0.37 m (d.d. 2.47-2.70)
Matrix characteristics:
Sediments 0.40 m in diameter about the wood consist of a very dark gray (10YR3/1) silty, clayey loam. The sediment outside the 0.40 m radius is mottled with a yellowish brown (10YR5/6).

ARTIFACTS FROM THE UPPER SEDALIA COMPONENT

POINTS

Chipped stone points from the Upper Sedalia complex are almost entirely from Feature 1124 and all are illustrated in Figure 13.14. With reference to Chapter 11, six categories, or types, are represented, including five types from Feature 1124 and an additional type from Feature 927. All points are very similar to established Late Archaic Rodgers Shelter types. The occurrence of widely divergent point types as an integral part of a larger activity loci suggests that point stylistic differences are highly correlated with functional prerequisites of these chipped stone tools. We should now be able to look at other sites such as Rodgers Shelter with renewed confidence in our ability to chart functional contrasts in site usages and artifact classes. Provenience data are presented in Table 13.7 for points and all other Upper Sedalia component artifacts.

Category 9: Smith

These large, basally notched points are represented by one complete and three fragmentary specimens; all were found *in situ* in Feature 1124. Two (Fig. 13.14c, e) were purposely heated, resulting in heat fracture of one (Fig. 13.14c). A third specimen (Fig. 13.14d) is impact fractured, while the final fragmentary Smith point may have been broken in basal thinning and possibly was not used. Dimensions of the complete specimens are: Length: 82 mm; Width: 41 mm; Thickness: 10 mm. One specimen is oolitic Jefferson City chert, two are banded Jefferson City chert, and the last is Burlington chert. Flaking on all specimens is essentially the same as that of the Smith points from Rodgers Shelter.

Category 17: Sedalia

One specimen (Fig. 13.14a) found *in situ* in Feature 1124 and is a complete lanceolate of oolitic Jefferson City chert. The point does not

Figure 13.14. Diagnostic artifacts, first two Sedalia components (a-e, h-j, m-p: upper component, all but p from Feature 1124; p from Feature 927; f, g, k, 1, from second component-Feature 1173). Top row: a, Sedalia lanceolate; b-e, Smith. Middle row: f, Sedalia Lanceolate; g, undefined point (reworked); h-j, Etley. Bottom row: k-1, Sedalia 'diggers'; m-n, stone; o, Category 15 darts; p, Category 42 point. Scale in cm.

TABLE 13.7

Provenience of Upper Sedalia Component Artifacts

2 m Grid Squares	Points	Other Bifaces	Cores	Hematite	Ground Stone
498SE520			1		
500SE508	2	8	8	2	7
500SE510	3	4	4	2	2
500SE512	1				
500SE520					6
500SE522			2		
500SE508	2				
502SE510	1	3	1		1
502SE512				1	3
504SE508		1	2	1	
504SE510		2	1	1	3
504SE512		3		4	2
506SE508		4			
506SE510		4	1	1	1
506SE512		1	2		2
508SE508		2			
508SE510		3			1
508SE512					1
510SE508		2	5	2	4
510SE510	1				
510SE512					
510SE514		1			
512SE508					
512SE510	1				
512SE512					1
512SE510			1		
514SE508				1	
514SE518				1	
514SE520			1		
516SE508		2			
518SE518			1		
522SE518			2		
522SE520			1		

appear to be heated, both form and size (dimensions: length: 107 mm; width: 31 mm; thickness: 11 mm) are similar to Rodgers Shelter Sedalia Lanceolates. The blade was shaped by alternate lateral soft hammer percussion flaking that resulted in a pronounced left lateral alternate bevel.

Category 50: Etley

Three corner notched Etley points (Fig. 13.14h-j) were found *in situ* in or near Feature 1124. Two are complete and have tapered tips, a dis-

tinctive blade attribute of some Rodgers Shelter and Blackwell Cave Etleys, the other has a transverse blade fracture. Heat treatment is indeterminate for all specimens, all are oolitic Jefferson City chert. Dimensions for the two complete specimens range from 64 mm to 83 mm in length, 35 mm to 40 mm in width, and 8 mm to 9 mm in thickness.

Category 49: Stone

Two straight stem Stone points (Fig. 13.14m,n) were also found *in situ* in Feature 1124. These are medium sized points and one is transversely fractured and heat treated. The two are of banded Jefferson City chert. Dimensions of the complete specimen are: length: 61 mm, width: 37 mm, thickness: 9 mm.

Category 15

A final *in situ* point from Feature 1124 is a small, roughly straight stemmed dart (Fig. 13.14o) of heat treated Burlington chert. Dimensions are: length: 48+ mm, width: 23 mm, thickness: 6 mm.

Category 42

A single specimen of this category is an *in situ* find (Fig. 13.14p) from Feature 927. The base is diagonally notched and the blade is impact fractured. The point is apparently beyond repair and probably was discarded.

BIFACES

Thirty-nine bifaces were recovered from the Upper Sedalia component. Twenty-seven (69%) are fragmentary, nine (23%) are complete and two (5%) are nearly complete. A single fragmentary specimen consists of two mended pieces.

These bifaces are all chipped from locally available cherts. The majority (27 [69%]) are banded Jefferson City chert while eleven (28%) are oolitic Jefferson City chert. Burlington formation chert is represented by only one specimen.

Almost half (19 [40%]) of the bifaces appear to have been intentionally heated as part of the manufacturing process. Among the fragmented specimens, thirteen (43%) were thermally fractured while two (6%) appear to have been broken during manufacture because of an irregularity in the raw material.

Blank type could be evaluated only for one specimen made from a chert nodule. Bifacial flaking is assessed by criteria (Chapter 10) which reflect percussive techniques as well as stages of manufacture along a continuum towards the production of a chipped stone tool. Fifteen (38%) bifaces exhibit very crude percussion flaking where the edges of the implement remain very sinuous. Of these, six have extensive areas of cortex remaining on one or both faces. Twenty (51%) bifaces show more refined percussion flaking with clear definition of the thinning flake scars and generally less sinuous edges. A single biface had been through final percussion thinning and purposeful shaping probably from a

combination of soft hammer percussion and some marginal pressure flaking. In this case, the edges are nearly uniform and reasonably straight. One last uniformly thin biface with generally straight edges is predominately pressure flaked or is the result of very well controlled soft hammer percussion. Flaking was not recorded for two fragmentary bifaces because of their small size. All of the bifaces in the sample were placed into techno-functional classes (Chapter 10) on the basis of nominal attributes. Sixteen (41%) are undifferentiated preforms, five (13%) are ovate preforms, two (5%) are rectanguloid preforms with ground edges while another is rectanguloid but lacked edge grinding. Of particular interest are two bifaces which appear to be representative of an Etley projectile preform and a lanceolate preform. Representative examples are included in Figure 13.15.

CORES

Twenty-nine cores comprise the sample from the Upper Sedalia component. The majority (26 [90%]) are complete. All of the cores are of locally available cherts. The range of raw materials includes seven (24%) cases of oolitic Jefferson City chert, eight (28%) of banded Jefferson City chert, twelve (41%) of cross banded Jefferson City chert, and two (7%) of Chouteau formation chert. One is made from a river cobble.

Four (14%) of the cores in the sample appear to have been intentionally heat treated.

The number of platforms exhibited on these cores ranges from one to three. Fifteen (52%) have a single platform, eleven (38%) have two and three (10%) have three platforms.

HAMMERSTONES

Three hammerstones were recovered from the Upper Sedalia component. All are complete. Raw material types include banded and cross banded Jefferson City and Chouteau formation cherts. None of the specimens appears to have been heat treated. A single hammerstone exhibits moderate battering on a single face and an edge. The other two have heavy and moderate wear on one edge. Two specimens are core-hammerstones and the other is a cobble.

HEMATITE

Sixteen pieces of hematite are associated with the Upper Sedalia component. None shows evidence of heat treatment. All of the specimens are very soft and each easily streaks paper. A single piece of hematite is ground and striated with the striations running along the long axis.

GROUND STONE

Thirty-two specimens of ground stone were recovered from the Upper Sedalia component. Only two (7%) are complete artifacts.

A range of locally available raw materials are represented in the ground stone sample. The range includes twenty-two (69%) cases of sandstone, four (13%) of quartzite and another four (13%) of oolitic Jeffer-

Figure 13.15. Generalized bifacial implements. Note h is Sedalia lanceolate preform; i, Etley point preform. Scale in cm.

son City chert. Instances of Burlington chert and of cotton rock are also noted.

The overall shape of the two complete specimens is amorphous. Sixteen (50%) are biplanar in cross section, two (7%) are airfoil, one is planar-convex and thirteen (41%) are indeterminate. In long section, twelve (38%) are biplanar, five (16%) are planar-convex, one is airfoil, one is concavo-convex and thirteen remain indeterminate.

Only a single specimen shows any evidence of manufacturing and maintenance modification. The face of this implement had been pecked to sharpen the working surface.

Twenty-six (81%) implements show evidence of use on a single face. Five (16%) were used on two faces and a single specimen was used on an edge. Twenty-eight (88%) have ground working surfaces, one has a marred surface and another is both ground and marred. Two implements do not show a specific form of use wear but are hematite stained which requires that they be included under the general heading of ground stone tools.

In all, six (19%) ground stone specimens were stained with hematite. Two of these also showed traces of limonite in addition to the hematite on their working surfaces.

Several classes of ground stone implements are represented in the Upper Sedalia component sample. Eight (25%) are classed as whetstones and/or undifferentiated ground slabs, two (6%) are fragments of a mortar or a metate, two are hematite processing slabs, two are anvils, one is a hand held grinding stone, and eleven (34%) are unidentifiable ground stone fragments; four of which are hematite stained. In all, only one of the identifiable ground stone tools in the component was probably hand held. The remainder are stationary implements. Representative examples are illustrated in Figure 13.16.

THE UPPER SEDALIA COMPONENT - DISCUSSION

Excavation of the Upper Sedalia component delineated small village architectural features over most of the 132 m^2 excavation block. Figure 13.6 shows the location of these features; to include storage pits, extensive lithic work areas, a hearth, posts and miscellaneous features. The storage pits, extensive lithic work areas and associated hearth reflect a divergent community layout of storage pits near the spring (southern end of the excavation block) and residential and chert heat treatment areas farther removed from the spring (in the northern end). Patterning of the posts and minor lithic concentrations is not as apparent.

On the basis of the features and artifacts associated with the Upper Sedalia component, a preliminary assessment of some of the activities carried out at Phillips Spring can be considered under the general headings of procurement, maintenance and specialized activities. (Procurement refers to activities involved with extraction of food and raw lithic materials. Maintenance refers to activities associated with food processing, storage, tool production and other domestic behavior. Specialized activities in the Upper Sedalia component refer specifically to pigment processing.)

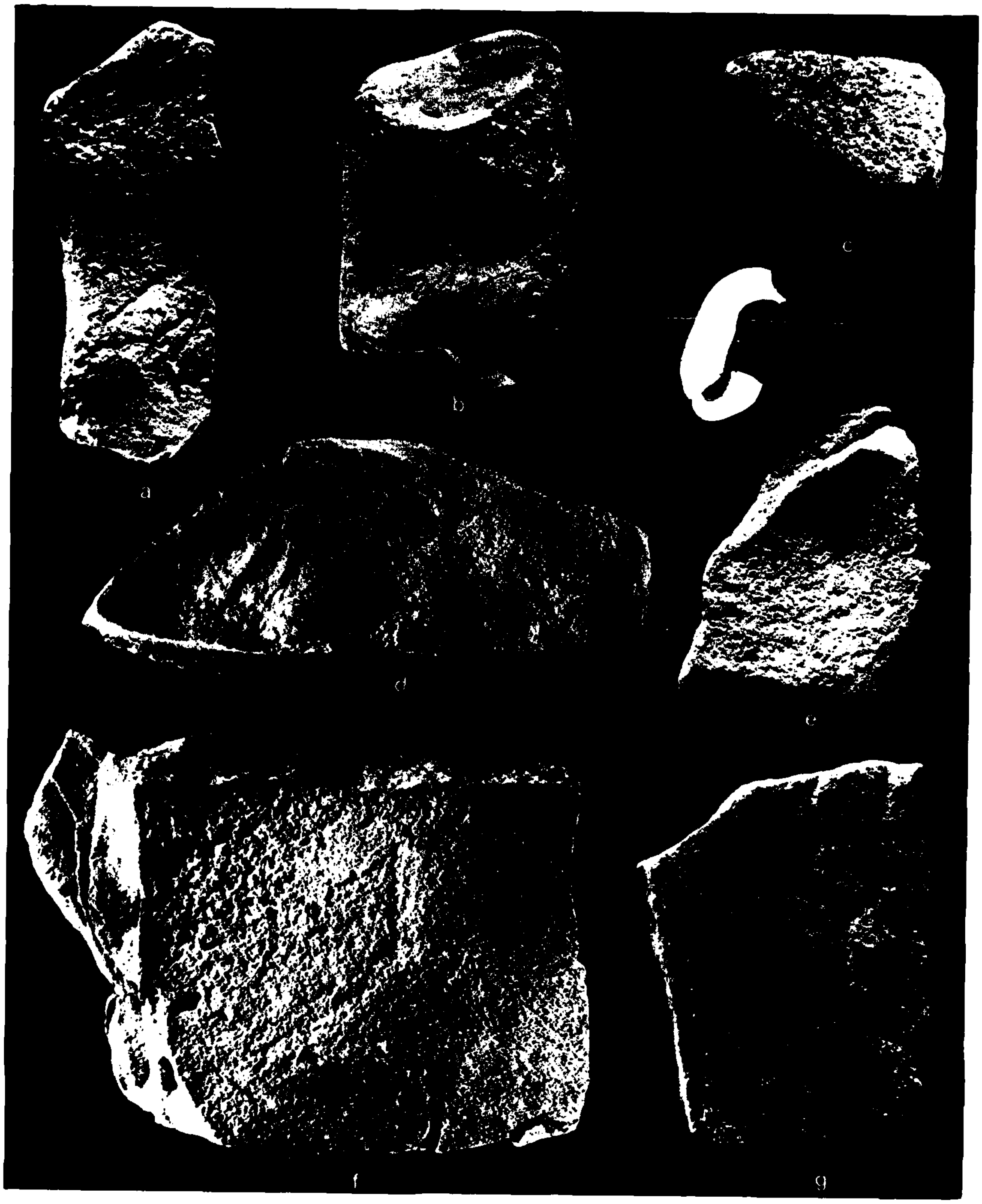

Figure 13.16. Ground stone. Scale in cm.

PROCUREMENT ACTIVITIES

Cultivation

The presence of squash (*Cucurbita pepo*) directly indicates cultivation of a specific tropical domesticate in the Upper Sedalia component. However, the multiplicity and frequency of wild botanical remains potentially used aboriginally for food as well as the faunal remains from this component suggest that hunting and gathering still figured prominently in the subsistence strategy of the inhabitants of Phillips Spring.

Hunting

Hunting activities are represented by the projectiles and faunal material associated with the Upper Sedalia component. Identification of the specific species hunted has been seriously impaired due to the poor preservation of bone in this component.

Gathering

The wild plants potentially gathered for food include a variety of species of nuts, berries and other plants known to have been eaten by native Americans.

COLLECTION OF RAW MATERIALS FOR STONE TOOLS AND PIGMENT PROCESSING

All of the raw materials reflected in the artifacts, debitage and unmodified rock debris are locally available. Extensive outcrops of these materials are located on the hillslope to the east of the site. There is little evidence of lithic materials collected from the river in the debris from this component. The distance of the hillslope sources from the site indicates that even the unmodified rock debris was aboriginally transported to the site rather than being the result of natural deposition.

MAINTENANCE ACTIVITIES

Processing of Plant Foods

The majority of ground stone tools from the Upper Sedalia component are fragmentary. However, the presence of mortar and/or metate as well as ground slab fragments indicate evidence for processing plant foods at least in part with stone tools.

Storage of Food Products

The botanical remains from the Upper Sedalia component were primarily recovered from the matrix of pits dug into the component floor.

Thermal Treatment of Raw Lithic Materials for Tool Production

Thermal treatment is reflected in both the artifacts and the exten-

sive lithic work areas from this component. The range of debris includes chert and other lithic materials that show no other modification other than heating waste flakes, cores and bifaces.

Chipped Stone Tool Production

A continuum of activities associated with chipped stone tool production from initial reduction through final manufacturing stages are represented in the Upper Sedalia component.

Wood Working

Several pieces of wood were recovered. Of these, at least two have definitely cut or shaped ends or edges. This direct evidence of wood working is complemented by indirect evidence such as the confirmed post molds. Apparently, modification of wood and use of timbers played an important role in maintenance and construction of structures, possibly storage of food stuffs in wood, slab-covered pits.

SPECIALIZED ACTIVITIES

Hematite Processing

Raw hematite, which for the most part is unmodified, and ground stone tools with hematite stains on their working surfaces indicate that hematite processing took place in the Upper Sedalia component. Hematite probably was a source of paint pigment.

PRELIMINARY COMMENTS AND PERSPECTIVE OF THE SECOND SEDALIA COMPLEX COMPONENT

The most impressive feature of the 1976 testing was sectioning the second Sedalia complex component. These excavations revealed an extensive architectural feature, also intersected by the first backhoe operation in 1973 and by Trench 3 cut in the final hours of the 1974 excavation. Though a number of parties have been involved, there is almost complete unanimity in description of this feature as a fired-rock and mussel shell concentration, the likes of which have not been encountered in over a decade of systematic excavation at Rodgers Shelter and at other archaeological components of Pomme de Terre springs. The initial plan for 1977 called for clearance of overburden from this feature, its systematic excavation, subsequent stratigraphic testing and collection of pollen samples. The rain combined with dewatering problems and the complexity of the Upper Sedalia component precluded execution of this plan. Sampling of this component was limited to excavation with Sq. 510SE508 and Figure 13.17 shows just how concentrated the feature matrix is.

Our data on this feature and of this component as a whole are admittedly spotty and imprecise. Only further excavation can clarify the exact function or functions this feature had within the Late Archaic Pomme de Terre subsistence-settlement system. Even so, there are certain more or less obvious contrasts with the Upper Sedalia component, though

Figure 13.17. View of second Sedalia complex component from excavation of Sq. 510SE508. Note heavy concentrations of fired dolomite and *in situ* artifacts; portion of feature shown was excavated in 50 cm^2 blocks for precise control and the square intersects the east edge of the basin shaped pit.

roughly the same range of activities are inferable (i.e., cucurbit cultivation balanced by procurement of game, gathering of wild plants, use of locally available Jefferson City cherts in stone tool manufacture, of which all stages are possibly represented including heat treatment and wood working).

The structure of the feature is, itself, a primary difference. The 1976 and 1977 excavations intersected the eastern edge of the pit in three locations and in each case it was seen that the feature is a rock-lined basin with gently sloping lips. It seems likely that the pit was purposely excavated. Measures of the pit size are very preliminary but, as mentioned previously, approximately 64 m^2 are represented by the basin itself and there may well be exterior architectural features as well. Figure 13.18 is a projection of pit shape based on the available data. Apparently most of the feature retains its integrity as the 1974 excavations terminated 20 to 40 cm above it. The dimensions projected are considerably larger than any of the residential units encountered in the Upper Sedalia component (8:1) though we are not suggesting necessarily a similar function. What is clear, however, is that there was a considerable--if not unprecedented--energy expenditure involved in pit construction and transport of the mainly large cobble-sized blocks of dolomite that make up the fill. The primarily dolomite fill contrasts also with the sandstone-quartzite-oolitic chert that comprise the bulk of the Upper Sedalia component unmodified rock.

Secondly, the amount of mussel shell is prodigious in comparison to other mussel shell features from Pomme de Terre sites. Rodgers Shelter has but one comparable feature from Stratum 3 (Chapters 7, 12; and McMillan 1971:85), a little more than a thousand years earlier than the Phillips Spring feature. Accurate counts of valves are precluded by their generally poor condition at Phillips, but there must be considerably greater numbers represented. Freshwater mussels seemingly became an important Late Hypsithermal staple but are not similarly represented by the Upper Sedalia Complex component. Thus, between 4000 and (probably) 3000 B.P., there appears to have been a basic shift away from primary exploitation of riparian habitats, perhaps brought about by limnological changes. (An alternative is that the 1977 block simply missed a similar Upper Sedalia component feature. But it would seem likely that, were this the case, at least some mussel shell would have been found.)

A final contrast is that community layout correspondingly differed between the two components. Although further excavation is crucial, it is clear that the configuration of the two components reflects functional differences in the way the spring locale was used. Similar differences in community layout are also inferrable for the Squash and Gourd Zone that is effectively sealed by the Second Sedalia component.

Bone preservation in this and the more deeply buried components is better than in the Upper Sedalia Component, and we can anticipate usable collections of both vertebrate subsistence and paleoenvironmental data from these units.

Component contents excavated in Sq. 510SE508 are summarized in Table 13.8. Culturally diagnostic items include a Sedalia lanceolate base (Fig. 13.14f), two Sedalia "diggers" (Chapman 1975:200-203) which, in fact, are adzes (Fig. 13.14k, l); a final projectile point (Fig. 13.14g) has been extensively reworked and is unclassifiable.

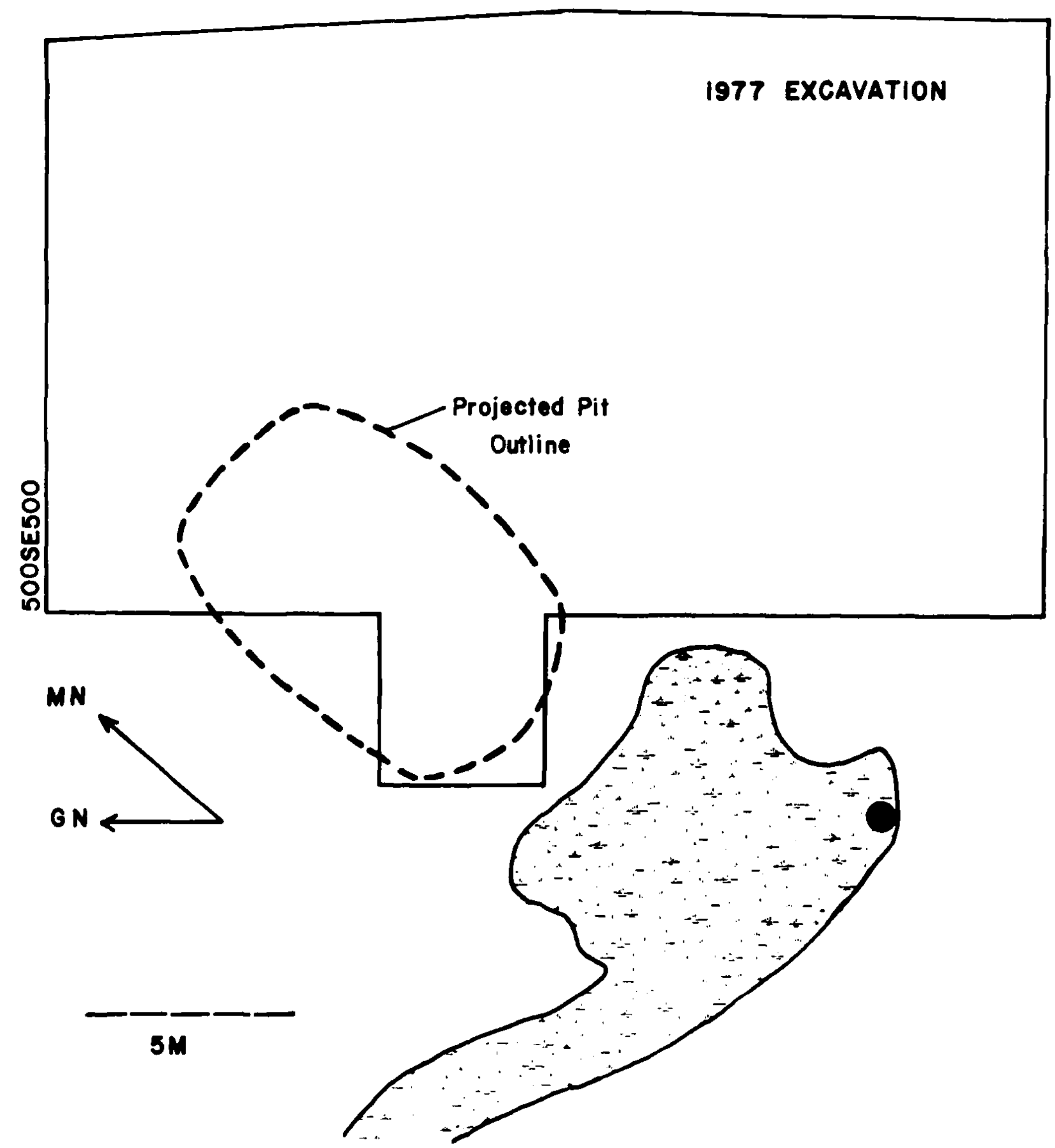

Figure 13.18. Projection of pit dimensions, second Sedalia component based on 1976, 1977 excavations.

TABLE 13.8

Second Sedalia Component Debris

Botanical	Faunal	Artifactual
Squash *(Cucurbita pepo)*	Mussel shell	Chipped stone points
Grape *(Vitis* sp.)	Bone	Late Archaic adze
Elderberry *(Sambucus* sp.)		Biface
Nuts		Waste flakes
		Biface fragment

SQUASH AND GOURD ZONE

This component is a roughly horizontal floor, about 10 cm thick of unknown dimensions. No culturally diagnostic artifacts were recovered in the small excavation nor were there any obvious architectural features. Botanical remains are prolific and a greater number of taxa and specimens were recovered from this component than from any of the others (Chapter 16). The squash and gourd remains were encountered from the edge of Trench 3 to the south profile wall, and once we first recognized the gourd rind, seeds of squash and gourd, it was relatively a simple task to individually plot *in situ* specimens or seed concentrations, one example of which is a mussel shell with several uncharred squash seeds. Equally pleasing was recovery of two *in situ* wooden tools, which provide some measure of the gardening technology. Representative squash and gourd seeds and of a digging stick of unpeeled oak are respectively illustrated by Figures 13.19 and 13.20. Artifacts from this component include:

Bifaces

A single basal fragment of a finished preform was excavated. It is oolitic Jefferson City chert and does not appear to have been heat treated. Flaking is probably a combination of soft hammer percussion and some marginal pressure flaking which produces nearly uniform and straight edges.

Cores

Five complete cores of locally available chert (two are of cross banded Jefferson City chert, one of banded Jefferson City chert, and another of oolitic Jefferson City chert) were found. None of the specimens appear to be heat treated. Three cores exhibit a single striking platform. The other two have two platforms. Platform preparation is present on one specimen.

Ground Stone

A single fragment of an undifferentiated ground slab was excavated. It is constructed of locally available sandstone and is biplanar in cross section as well as in long section. The implement is ground on a single face and exhibits no evidence of modification that can be attri-

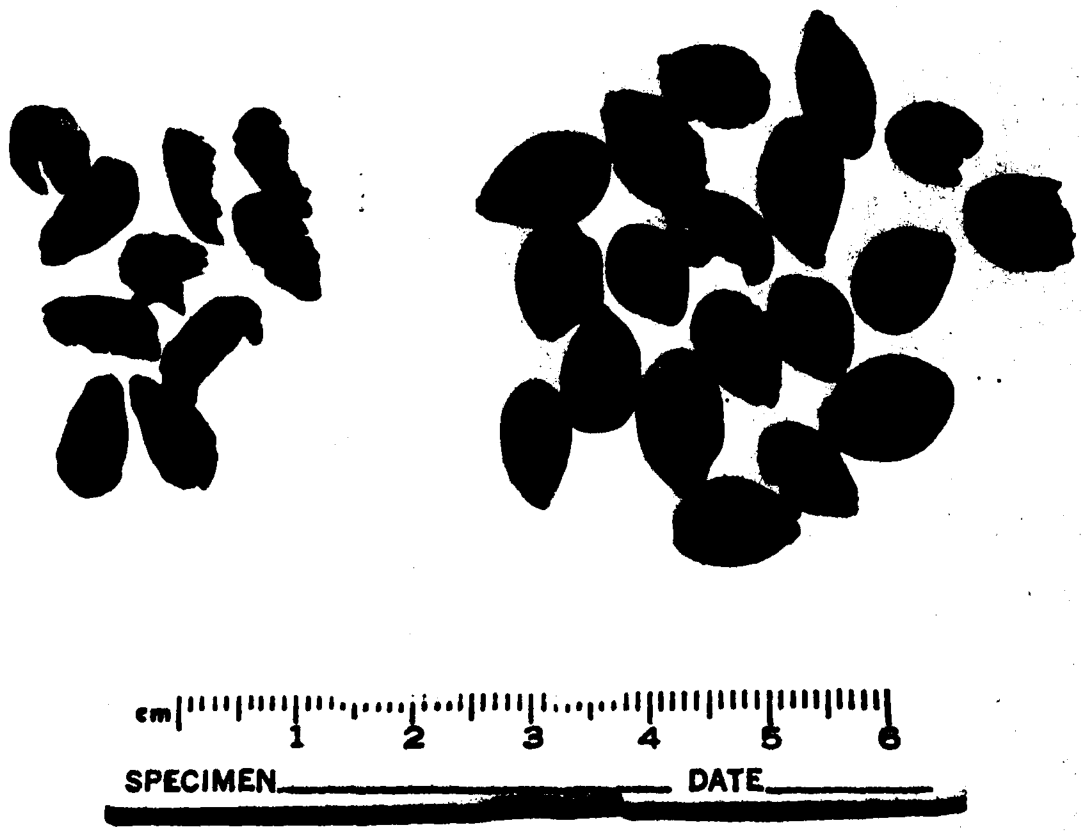

Figure 13.19. Bottle gourd (left end of scale) and squash (right end of scale) seeds from Phillips Spring; seeds are uncharred.

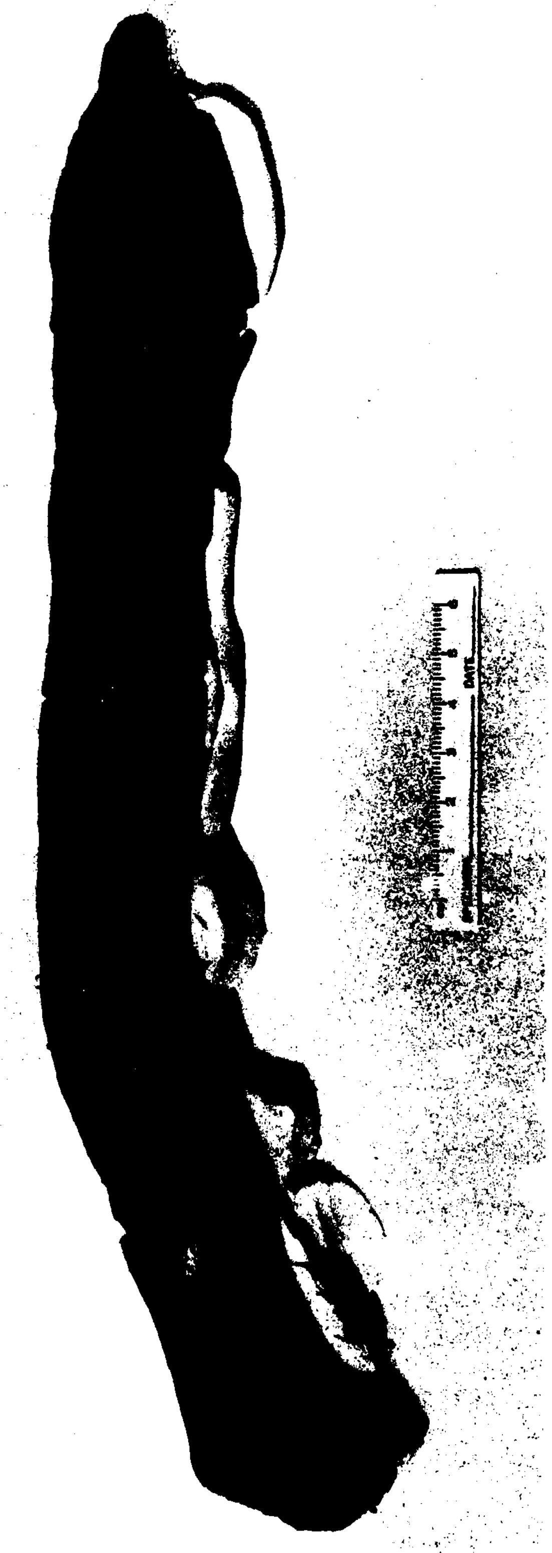

Figure 13.20. Wood digging stick from Squash and Gourd Zone.

buted to manufacturing or maintenance activities.

Wooden Tools

Two wooden implements were associated with the Squash and Gourd Zone. One specimen is a digging stick while another is an unidentified spatulate tool.

At this point it is premature to infer the range of activities represented by this component. It should be clear, however, that an unusual opportunity exists to thoroughly reconstruct the prehistoric lifeways of the inhabitants of the Squash and Gourd Zone. For the preservation environment is such that virtually all material evidence is available. We can say that the activities conducted include roughly the same sets of the successive Phillips Spring components; and, of these, perhaps the clearest expression of prehistoric gardening. The earliest evidence of plant husbandry, however, is found in the next provisional component, as yet dated, and we anticipate that in the components sectioned by the piston core that other evidence of tropical cultigens may also be forthcoming.

Table 13.9 summarizes activity sets of each Late Archaic component.

TABLE 13.9

Summary of Activity Sets Represented at Phillips Spring

Activity Set	Component: Upper Sedalia	Second Sedalia	Squash & Gourd	Last Visible Cultural Zone
PROCUREMENT				
Cultivation				
Squash	X	X	X	X (2)
Bottle gourd			X	
Hunting	X	X	X	
Gathering				
Wild Plants	X	X	X	
Mussels		X	X	
Collection of Raw Material for Tools				
Chipped stone	X	X	X	
Ground stone	X		X	
Wood tools			X	
Pigments	X			
MAINTENANCE				
Processing of Plant Foods	X		X	
Storage	X			
Heat Treatment	X	X		
Production of Tools				
Chipped stone	X	X	X	
Wood			X	
Wood Working		X		
SPECIALIZED				
Hematite Processing	X			

INTERSITE CORRELATIONS

A preliminary statement of intersite correlations of Phillips Spring begins with the lower Pomme de Terre Valley and then addresses regional comparisons. Stylistic, radiometric and site function data will be employed, though it is recognized that no single or multiple listing will thoroughly account for all probably correlations, or even of those Phillips cultural components that now are reasonably well dated. Of necessity, we shall deal only with the three dated Late Archaic components sectioned in 1977, and will restrict comments and comparisons to other excavated sites having solid stylistic and radiometric controls.

LOWER POMME DE TERRE

There are several excavated sites within the locality that correlate stylistically and grossly in age with one or another of the Late Archaic components at Phillips Spring. Rodgers Shelter and Blackwell Cave (Wood 1961; Falk 1969:40-111) fall in this category and probably have major similarities in age and point styles with the Upper Sedalia component, tentatively dated at 3000 B.P. Neither site, however, appears to be functionally similar as judged from the absence of storage pits and other diagnostic Phillips architectural features. The Second Sedalia component at Phillips is reminiscent of an earlier mussel shell feature at Rodgers Shelter that is dated about 5100 B.P. but additional excavation is needed at Phillips to clarify the function(s) of the mussel shell and fired-rock filled pit.

Other excavated Pleistocene springs have archaeological components that may or may not correlate with Phillips Spring. With the exception of Trolinger, all of the spring excavations reported by Wood (1976) produced stylistically similar artifacts, primarily chipped stone points, to those found at Phillips as well as a limited number of architectural features. Excavations at Boney Spring were most extensive but produced only a small number of Late Archaic Smith and Etley points, which are part of the Phillips Sedalia complex. A date of 4200±140 B.P. (A-1076) on nuts from the base of Unit J, a brown peat at Boney (King 1973:547) is certainly within the time frame of the Phillips Squash and Gourd Zone but cultural associations are unclear. Koch Spring also produced diagnostic Sedalia complex artifacts from around the conduit, including a probable Sedalia lanceolate base misidentified by Wood (1976:107). The possibility exists as well that the few architectural features, including a burial, from Koch correlate with the Koch Sedalia artifacts, but neither dating nor extensive excavations needed to clarify intrasite relationships have been conducted. Regardless, it would seem doubtful that the archaeological record at Koch is older than Late Archaic.

Larger Osage Basin and Surrounding Areas

Studies of springs in the Osage basin, other than those in the Pomme de Terre, are restricted to exploratory reconnaissance designed to identify Pleistocene vertebrate fauna (Saunders 1978). In the course of this work, Saunders encountered several springs having notable Holocene records and archaeological components. None of these are dated and only one,

Fielas Crawford Spring, produced diagnostic artifacts. We have compared the two chipped stone artifacts from Fielas Crawford Spring with Sedalia artifacts from Phillips. One is a distal fragment of a large bifacially worked blade, probably a Smith point, the other is an adz that is virtually identical to adzes recovered from Phillips Sedalia components.

Other excavated Osage basin sites including both terrace and rock shelter sites are on stylistic grounds similar to Phillips Spring. These include Fulton (Falk and Lippincott 1974; Lippincott 1972), Miller (Vehik 1974), Saba Shelter (Vehik 1974), and Merideath (Falk 1969).

A last Osage site, Thurmon, was the subject of a relatively large scale and deep excavation (Falk and Lippincott 1974) resulting in definition of Late Archaic features, artifacts and a single basal date of 2690±200 B.P. (M-2110 and M-2111, combined). The few diagnostic points from the basal units are either Smith or Etley points, and are well within the range of variation of excavated lower Pomme de Terre points of these two categories. The date is also nearly identical to one of 2680±150 B.P. (M-1929) from Blackwell Cave (Falk 1969:48); and while probably later than the excavated Phillips Sedalia components, this suggests that this complex continued later than 3000 B.P.

A final site, Nebo Hill, near present day Kansas City, Missouri accords an opportunity to compare Phillips with related sites along the southern Prairie Peninsula border. Reid (1977) reports a date of 3555±65 B.P. (UGS-1332) for a Nebo Hill "floor" having an associated Sedalia lanceolate.

DISCUSSION AND FINAL OBSERVATIONS

Phillips Spring is remarkable because of its preservation environment. The water saturated sediments effectively compartmentalize successive occupation floors, architectural features and perishable technological, ethnobotanical and vertebrate remains as well as Holocene pollen. Several of the later "living floors" are now dated, or will be shortly. And we now have firm documentation of not only extensive Late Hypsithermal occupation in the lower Pomme de Terre Valley but also of early use of tropical domesticated plants, first cultivated in Mexico. With these components, there is an opportunity without parallel in Truman Reservoir to greatly expand our knowledge of Holocene adaptations in the Ozark Highland. To be sure, we have come a long way with these excavations. We also have a long way to go. In discussing these developments, we wish to focus on two questions: (1) What have we learned? and (2) What do we need to learn?

Chiefly, we have learned that this site is extremely complex and requires a strategy of large scale excavation to satisfy interdisciplinary needs. Speaking here strictly of the archaeology, it is apparent that each component has its own internal morphology, or structure, and we cannot expect that community layouts are necessarily similar. Indeed, quite the opposite seems to be the case. This presents an all-too-rare opportunity to systematically work up these differences within a single cultural tradition, nominally known until now as the Sedalia complex. The importance of this is not in comparing apples with oranges, so to speak. But rather, it is in monitoring changing man-land relationships over a several thousand year record by peoples who apparently retained a

high degree of cultural identity. As we have seen from Rodgers Shelter, the Holocene of the Ozark Highland is anything but static. The relationships of early gardening at Phillips to changing environments, and to changing forms of social organization that led to greater residential stability are problems for the future.

What we can say for now is that this site and two others from the Green River of western Kentucky (Marquardt and Watson 1977) are our best evidence of early plant domestication in eastern North America. The Green River sites have been radiometrically dated to roughly the same time frame of 4000 or more years ago. This points out an embarrassing lack of data, perhaps more easily appreciated now that we know of limitations in recovery and particular site preservation environments. But nonetheless, the introduction of tropical cucurbits into the Mississippi Valley subarea (Willey 1961:78-79) was apparently rapid and widespread, and neither Phillips Spring nor the Green River sites should be thought of as isolated events. Two routes of diffusion are most likely possibilities and are not mutually exclusive. These include (1) from Mexico through the southern and central Plains into the Ozark Highland and from there eastward into the Mississippi Valley system; or, alternatively, (2) from Mexico to the Gulf Coast and then northward through the Mississippi Valley system. Sites along these probable diffusion routes may hold the key.

Lastly, these data suggest an alternative to the "midden heap" hypothesis (Fowler 1971:122-128; Struever and Vickery 1973) of native plant domestication in the Mississippi Valley. Rather than being regarded as an independent innovation, the domestication of a number of weedy species such as sumpweed (*Iva annua* L.), sunflower (*Helianthus annuus* L.), and perhaps chenopodium (Yarnell 1976; Asch and Asch 1977) may be more profitably thought of as having been stimulated by the cultivation of cucurbits. Nevertheless, Fowler's (1971) position that plant husbandry became established during the Archaic of eastern North America is confirmed; indeed, as he suggested, experimentation with cultigens may have had a significant effect on the economies and residential stability of Archaic and later Woodland cultures of this area.

In sum, Phillips Spring may best be compared to a good book. At present we are between a third and half the way through it and, to be sure, what is in store in later chapters is largely unknown but extremely interesting. We have an opportunity that probably will not come again in Truman Reservoir to decisively add to our knowledge of prehistoric communities in the Ozark Highland. There can be no question of the national and continental significance of this site.

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APPENDIX

POINTS FROM OVERBURDEN REMOVAL

Eleven chipped stone points were recovered during removal of overburden from 4 m squares. Tables 13.10 summarizes provenience, and the artifacts are illustrated in Figure 13.21. Five point types (Chapter 11) are represented by nine specimens; the two remaining artifacts are fragmentary and cannot be classified.

TABLE 13.10

Provenience Data

Category	Specimen Number	Coordinates	Datum Depth	Remarks
7	296	512.7SE507.7	2.55	
8	264	520SE513.4	2.62	
9	208	509.9SE513.2	2.48	
	265	500SE512		General level
	291	509.7SE511.1	2.78	
13	207			Trench 5 backfill?
	254	500.7SE509.3	2.43	
	386	506SE510	2.64-2.82	General level
48	248	501.6SE509.7	2.52	
Miscellaneous	257	508.1SE505.5	2.46	
	857	502SE510	2.79-2.82	General level

Category 7: Gary

One contracting stem Gary point was recovered. This specimen is heated, Chouteau formation chert and has a reworked distal impact fracture. Dimensions are: length: 57 mm, width: 32 mm, thickness: 8 mm.

Category 8: Langtry

One contracting stem Langtry point was also excavated. This specimen has a transverse blade fracture, is of banded Jefferson City chert, heating is indeterminate. Dimensions include: width: 33 mm, thickness: 7 mm.

Category 9: Smith

Two complete and one fragmentary specimens were recovered. All are Jefferson City chert (two, banded; one oolitic); and the complete banded chert point has been heated. Flaking of the complete specimens includes consistent high quality marginal retouching of blade edges, which are assymetric and probably were resharpened. Dimensions range: length: 64-73 mm, width: 39-41 mm, thickness: 8-9 mm. The fragmentary specimen

Figure 13.21. Chipped stone points from overburden removal: a, Category 7; b-c, Category 8; d, Category 48; f-h, Category 13; j-l, Category 9; e, i, Miscellaneous. Scale in cm.

has a transverse blade fracture and shows preliminary basal notchings; possibly it was broken while the base was being notched.

Category 13

Three dart points were excavated; each is impact fractured and was heated. All are of Jefferson City chert (two, banded; one, oolitic). All three would be indistinguishable from Category 13 darts from Rodgers Shelter.

Category 48

One medium sized corner notched point was found. This is similar to other Category 48 points from Rodgers Shelter. Dimensions are: length: 62 mm, width: 36 mm, thickness: 9 mm. The specimen is of unheated oolitic Jefferson City chert.

Miscellaneous

The two remaining point fragments are both heat fractured. Both are Jefferson City chert, banded and oolitic, and neither are classified.

CHAPTER 14

GEOCHRONOLOGY OF PHILLIPS SPRING

C. Vance Haynes

Phillips Spring is located on a 6.5 m terrace (T-1b) of the Pomme de Terre River in Hickory County, Missouri. The discharge of ca. 25 gpm rises in a basin approximately 1 m deep and 8 m in diameter and flows westward 80 m to the river through an outlet channel 1.5 m deep and ca. 2.5 m wide. The terrace, approximately 160 m wide at the spring, consists of ca. 6 m of clayey silts over 0-2 m of stream rounded chert gravel. The site is important scientifically because of several factors; i.e., at least four buried archaeological components, plant macrofossils (including some of the oldest squash seeds known in America), radiocarbon samples, and fossil pollen all within a complex stratigraphic framework from which the fluvial response of the Pomme de Terre River to climatic change may be read.

Work at Phillips Spring over the past few years (Chomko 1976; Chapter 13) has produced very important archaeological information that fills a gap in the record from Rodgers Shelter which has the most complete record for the region (McMillan 1976; Ahler 1976; Chapter 4). Initial test trenching and sampling in 1973 revealed organic, pollen bearing sediments to a depth of 3 m from where a radiocarbon sample of wood provided a date of 7870±90 (SMU-78). In subsequent investigations we have tried to systematically sample and date this older part of the record without success (Haynes 1977; Chapter 15) in part because of difficulties in holding down the local water table against a combination of increased rain and failing pumps. Furthermore, radiocarbon dating has indicated that a stratigraphic break or hiatus may exist in part of the site even though only weak contacts occur in the carefully prepared exposures.

By compiling the data from all of this work, reassessing the stratigraphic position of all radiocarbon dates and evaluating core hole data, it is apparent that the terrace at Phillips Spring is compound and composed of two alluvial deposits separated by an erosional hiatus. Figure 14.1 is a stratigraphic profile made from a trench excavated in 1974 through the spring. All radiocarbon dates have been projected to this profile maintaining stratigraphic integrity. From these data, it is clear that an erosional hiatus exists between unit C and units K, D and E. After the 1974 field season, two contacts of my original drawing were modified as a result of the archaeological work (Chomko 1976). One modification consisted of omitting the very weak contact between unit C and what is now referred to as unit K because it could not be traced northward for any more than 4 m and was thought to be insignificant. The other modification was to extend the H/G and G/F contacts from the spring basin southward to Trench 1 on the basis of a weak contact now shown as that between units C and J (Fig. 14.1). The result was the extension of unit G outward from both sides of the spring as shown in Figure 7 of Chomko (1976). It is now more likely that my orig-

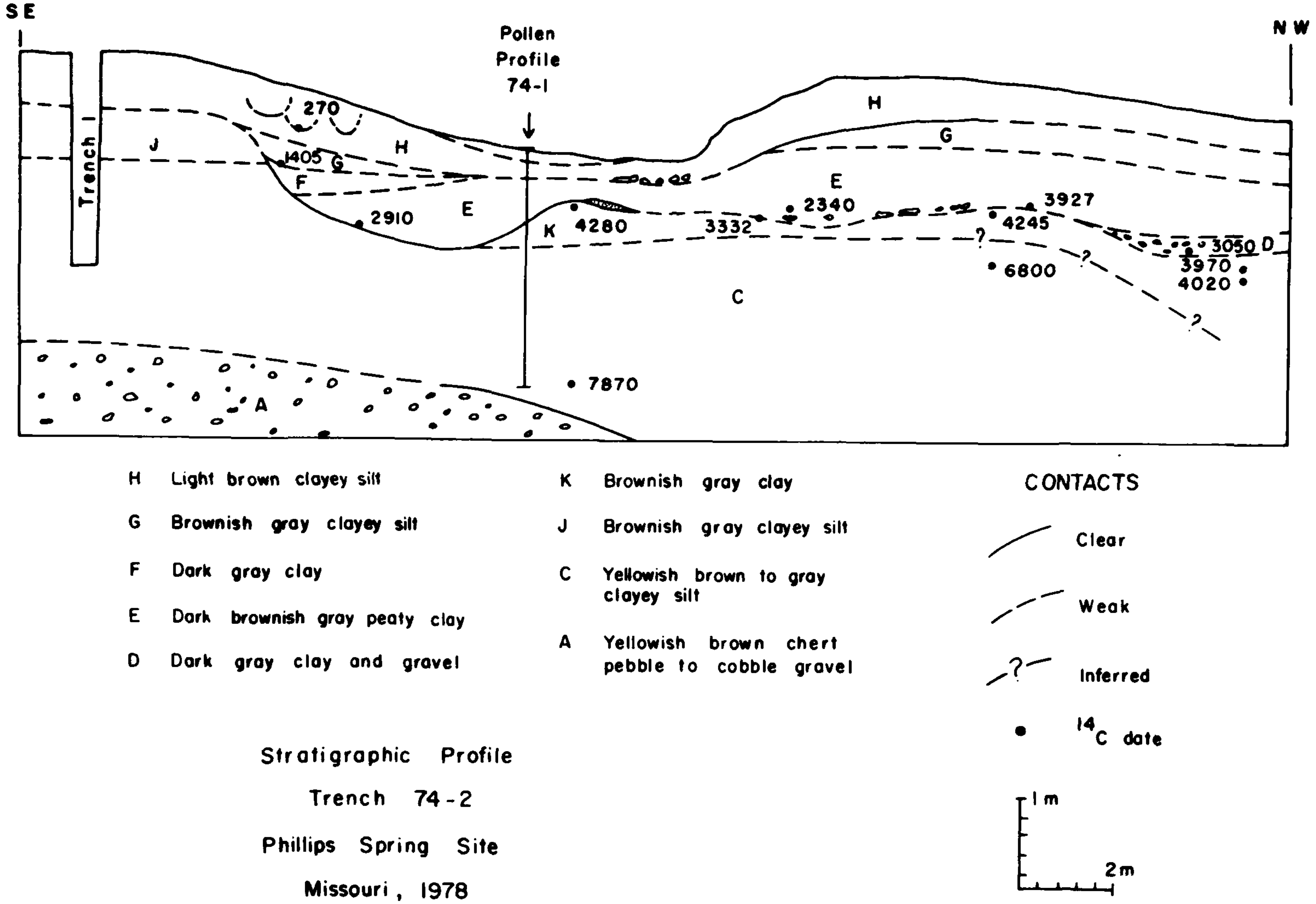

Figure 14.1. Stratigraphic profile Trench 74-2, Phillips Spring Site, 1978.

interpretation was correct and unit G is one of five units (K, D, E, F and G) inset into units C and J and separated from them by an erosional hiatus as shown in Figure 14.1. If so, unit G does not occur south of the spring.

If these latest interpretations are correct, aggradation of the Terrace (T-1b$_2$) ended with the deposition of unit J sometime after 6800 B.P. At Rodgers Shelter, there is evidence suggesting that this epicycle did not end until 6300 B.P. (Haynes 1977) after which down cutting occurred. At Phillips Spring, the next stage (T-1b$_3$) of aggradation (unit K) of Rodgers alluvium began before 4300 B.P. and had reached the eroded top of unit C by then (Fig. 14.1). The contact at the top of unit K is also erosional and contains a strong archaeological component as does unit K and to a lesser extent unit C. With so much archaeological material concentrated within a meter, vertically, and separated by at least four irregular and obscure erosional contacts from which cultural features such as storage pits and fire hearths were excavated, it is no wonder that inconsistencies have occurred. The D/K and E/K contact has six radiocarbon dates on, above, and below it. Sample SMU-235 (3050±60 B.P.) is scattered charcoal collected from the exposed surface of unit K (unit C$_2$ of Chomko 1976) and SMU-331 (3332±48 B.P.) is charcoal screen-washed from a shallow pit (feature 3) apparently excavated from the same surface. A sample of wood (SMU-236:2340±80 B.P.) from above this surface is consistantly younger and one below (SMU-483:4222±57 B.P.) is older. Charred wood of SMU-319 (3927±61 B.P.), on the other hand, was screen-washed from a feature (shallow pit) above the contact and is ca. 800 years too old. Large fragments of charcoal (SMU-98: 4310±70 B.P. and SMU-102:4240±80 B.P.) from a cultural rock layer exposed by the 1973 test trench have been thought to equate with unit D but are at least 1000 years too old for such an interpretation. Earlier charcoal was inadvertently incorporated into the feature or the cobble-charcoal-and-artifact layer encountered by the 1973 test trench is not the same as unit D. Another possibility is that the surface from which the scattered charcoal of SMU-235 was collected actually projects over unit D. Although these discrepancies are minor in scope, future excavations and micro stratigraphic work will hopefully resolve them.

Core holes and wells put around the spring reveal that the basal gravel (unit A) is not continuous. The fine grained top strata extend all the way to bedrock immediately east of the spring and ca. 40 m north. These irregularities in the gravel and its nearness to the surface at the spring are probably the cause of the spring being where it is. J. King (Chapter 15) has pointed out that in spite of extensive excavations and boring, no feeder or conduit has been found. Maybe the outlet channel is a manmade feature constructed by a farmer in order to drain a perennial wet spot in his field. On the other hand, the archaeology appears to be related to the spring indicating that it must have been more than just a wet spot during Middle and Late Archaic times.

The origin of the K/C and E/K erosional contacts is not clear. They could be due to flood scour by the main river, cutting via the bedrock gulley in the bluff east of the spring, or cutting due to violent spring discharge, the latter being the least likely because of a lack of evidence for a conduit. Two core holes in the field east of the

spring showed brown silt on top of gravel (King, pers. comm.) instead of gray clayey silt as was exposed by most of Trench 1. Whereas this could be a channel fill related to the bedrock gulley, it does not appear very likely because of the very small catchment. It could also be simply a facies change within the terrace alluvium (unit C).

The most likely cause of the cutting and filling at the spring is scour by the Pomme de Terre and, as mentioned previously, there is a stratigraphic break (Stratum 3) and soil at Rodgers Shelter that suggests degradation during the same time period (6300 - 5200 B.P.).

Future geologic work at Phillips Spring will focus on further clarifying the stratigraphy of the terrace deposits around the spring and obtaining more radiocarbon control on the strata. A special effort will be made to relocate the lower organic horizon of the 1973 test trench.

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CHAPTER 15

PALYNOLOGICAL INVESTIGATIONS AT PHILLIPS SPRING

James E. King

Archaeological excavations at Rodgers Shelter, conducted over a number of years have revealed a record of almost continuous human activity for much of the last 10,500 years (Wood and McMillan 1976; Chapters 3-12). These archaeological studies have been complemented by sedimentological analysis of sediments from the Shelter (Ahler 1973; and Chapter 5) and intensive geological studies from the Pomme de Terre River Valley that have provided a model for late Quaternary deposition within the area (Haynes 1976). As a result, cultural and associated geological changes in the western Missouri Ozarks are being integrated into a general outline of Holocene climatic and paleoenvironmental fluctuations for this region.

As part of this research effort, palynological investigations were initiated at Rodgers Shelter at an early stage in the work (1966). Unfortunately, it was soon determined that the sediments in the Shelter had been subjected to leaching, oxidation, and microbial activity and, as a result, any pollen that might have been present originally had not been preserved. These factors are major causes of pollen destruction in sediments in the eastern United States (King, Klippel and Duffield 1975) and are especially prevalent in archaeological sites.

In contrast to the Shelter, certain spring bogs that occur locally along the Pomme de Terre River have yielded unique and abundant records of late Pleistocene fauna and flora (King 1973, Saunder 1977). The Pleistocene deposits in these springs span the period from at least 48,000 to 13,000 years before present (B.P.) and in one spring, Boney Spring, these older sediments were overlain by several meters of Holocene-age alluvial clays and peats (King 1973:Figure 7; Haynes 1976). These Holocene sediments contained little or no pollen despite the presence of well preserved fiberous peats with hickory nuts and acorns. These peats, which occurred in the top 1 m at Boney Spring, apparently had been subjected to alternate wet and dry cycles caused by fluctuations in the spring discharge rate. What little pollen remained in the sediments was severely degraded in the characteristic patterns of microbial digestion (Elsik 1971). Soil microroganisms are most abundant in moist soils, dry or water saturated conditions inhibit their growth and activities. The presence of a human burial and Woodland-age storage pits containing hickory nuts, acorns and squash seeds (King and McMillan 1975) within these peats confirm that the presently water saturated surface sediments have been considerably drier in the past.

The alluvial clays underlying the surface peats at Boney Spring also did not contain pollen. These clays which accumulated between 7200 and 4200 B.P. (Haynes 1976) comprise the greatest thickness of Holocene sediments in the Pomme de Terre Valley. They have been examined palynologically from a number of sites and terrace situations within the valley yet have never been found to contain pollen. These alluvial clays, which are present at Rodgers Shelter (Stratum 1), Boney Spring and Phillips

Spring do, however, contain occasional flecks and small concentrations of charcoal which have allowed radiocarbon dating of these critical sediments. Thus, while their paleoenvironmental interpretation is sketchy, their chronology is fairly well understood.

The Pleistocene-age spring bogs within the Pomme de Terre Valley as well as numerous other possible spring sites have been thoroughly tested in an attempt to locate Holocene-age sediments containing pollen. Thus, Phillips Spring was originally tested in 1973 and sediments containing some preserved pollen were located at a depth of about 3 m. As a result, further work was planned to recover those portions of the post-Pleistocene palynological record preserved in this spring.

SETTING, STRATIGRAPHY AND PALYNOLOGICAL SAMPLING

Phillips Spring, located about 5 km upstream from Rodgers Shelter lies on the right (east) bank of the Pomme de Terre River on a small remnant of the Rodgers Terrace, T-1b (Haynes 1976) several meters above the present river channel. The artesian spring occupies a small basin (Fig. 15.1) about 8 m in diameter in the middle of the terrace approximately halfway between the river and the bluff, a total distance of 160 m. A small outlet channel (Fig. 13.2) connects the spring basin with the river. The spring flows throughout the year and when measured during July 1974, had a discharge rate of approximately 1500 gallons per hour. Although the terrace was under cultivation (navy beans in 1974), the spring basin contained a small marsh community including cat-tails (*Typha* sp.), arrowhead (*Sagittaria latifolia*), sedges (Cyperaceae) and aquatic mosses.

Initial testing at Phillips in the late summer of 1973 revealed a stratigraphic sequence composed of dark colored clays, organic zones, and a buried cultural horizon containing artifacts, burned limestone and decayed mussel shell. Pollen samples from organic clays yielded some pollen and demonstrated that at least a partial Holocene pollen chronology might be present in the spring. Wood associated with one of the pollen samples was radiocarbon dated at 7870±90 B.P. (SMU-78). In addition, the occurrence of artifacts on the surface indicated that a second archaeological component occupied several acres of the plow zone surrounding the small spring basin. This surface site was separated by at least 1 m from the buried cultural component.

Subsequent excavations at Phillips Spring were designed to explore the nature of the archaeological remains around and within the spring, and to excavate a trench across the spring for stratigraphic mapping, radiocarbon dating and the collection of a pollen profile. There was also the possibility that we might find faunal remains within the spring that would provide a model of Holocene faunal deposition for comparison with the extensive late Pleistocene faunas already excavated from the valley. Because Phillips Spring is the only Holocene-age spring located on the Rodgers Terrace, T-1b (Haynes 1976), that has been excavated, it was crucial to map the internal spring stratigraphy and to understand its relationship to the terrace sediments for comparison with the older Pleistocene-age spring deposits. The archaeological excavations demonstrated that a large buried Late Archaic site occurred in the immediate vicinity of the spring (Chomko 1976) and cultural manifestations including large flat limestone slabs extended into the spring basin forming a

Figure 15.1. The spring basin at Phillips Spring as it appeared in the summer of 1974.

stepping stone pattern that suggested at the time of occupation, spring discharge was less than its present rate.

Two long pollen profiles were collected during the 1974 excavations, Profile 74-1, from sediments within the spring basin, and Profile 74-2, collected from the wall of a deep test pit on the south side of the spring (Fig. 13.2). In addition, numerous individual pollen samples were collected from archaeological features within the site. During the 1976 and 1977 excavations additional pollen profiles were collected from within the spring basin and its surrounding area.

As at any spring site, the stratigraphy within and immediately adjacent to the spring is complex; with Phillips Spring, however, the problems of stratigraphic interpretation are compounded by the site's close proximity to the river. The stratigraphy reveals the alternating influences of the spring and the river. Once out of the area of saturation by the spring discharge, however, the terrace stratigraphy is less complex and rather uniform.

The terrace stratigraphy (Fig. 15.2) was mapped by Haynes in 1974 (Chomko 1976:Fig. 6; see also Chapter 14) from a backhoe trench excavated from the river to the bluff. The upper surface (unit HO was completely disturbed and included the plow zone. This disturbance is especially intense near the spring, reaching depths of almost 1 m. Directly underlying unit H is a weakly aggregated yellowish-brown silty clay (unit G) containing artifacts. This unit contains the major buried archaeological component. Below unit G is a massive thickness of sticky gray clay (unit C) which rests, in turn, on the basal alluvial gravels (unit A). Unit C contains a few artifacts in its uppermost portion but for the most part is culturally sterile and can be divided into two sub-units on the basis of color, representing fluctuations in the water table (Chomko 1976:16). A radiocarbon date of 7870±90 B.P. from within the organic clays (lower unit C) above the basal gravels as well as younger dates from the archaeological component suggests that the terrace sediments have been accumulating throughout much of the Holocene. Within the area influenced by the spring aquifer, there has been the development of localized zones of organic clays (unit E) between units G and C, and within the spring basin, a small lens of organic peat occurs between units E and C (Fig. 15.3). This peat lens, maximally 50 cm thick, is composed of two sub-units, an upper zone of partially decomposed fiberous plant remains and a lower zone of well preserved moss. Pollen profile 74-1 was collected through the spring sediments from the upper disturbed unit H to the basal gravels, a total depth of 2.5 m (Fig. 15.4). The entire stratigraphic sequence within Phillips Spring including the organic clays (unit E) and the peat lens were sampled. Pollen Profile 74-2 to the south of the spring basin, was collected from sediments representative of the terrace stratigraphic sequence and sampled units H, G, E and C. The additional cores and profiles collected during 1976 and 1977 essentially repeated the stratigraphic sequence sampled by Profile 74-2.

PALYNOLOGICAL RESULTS

To date, 135 samples have been processed for pollen from Phillips Spring in an attempt to recover as much of the Holocene vegetational record as is preserved within the site. The entire stratigraphic sequence

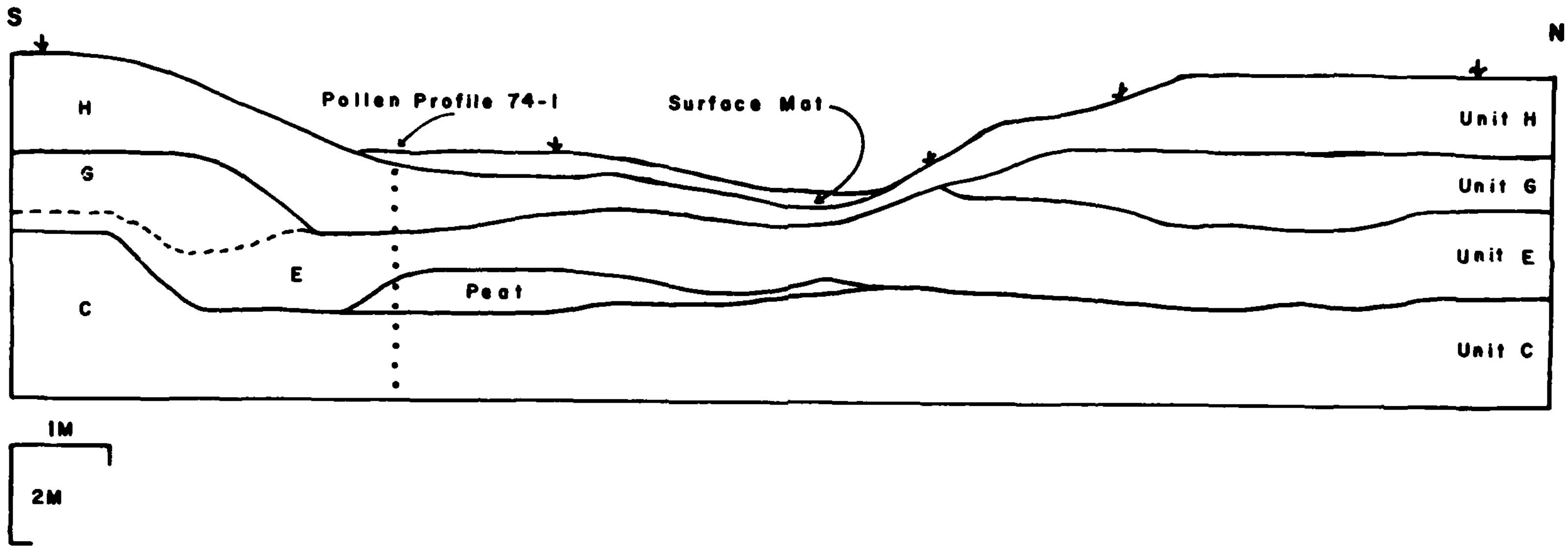

Figure 15.2. Stratigraphic cross section of Trench 2 across the spring basin. See Figure 13.2 for location, and Figure 14.1.

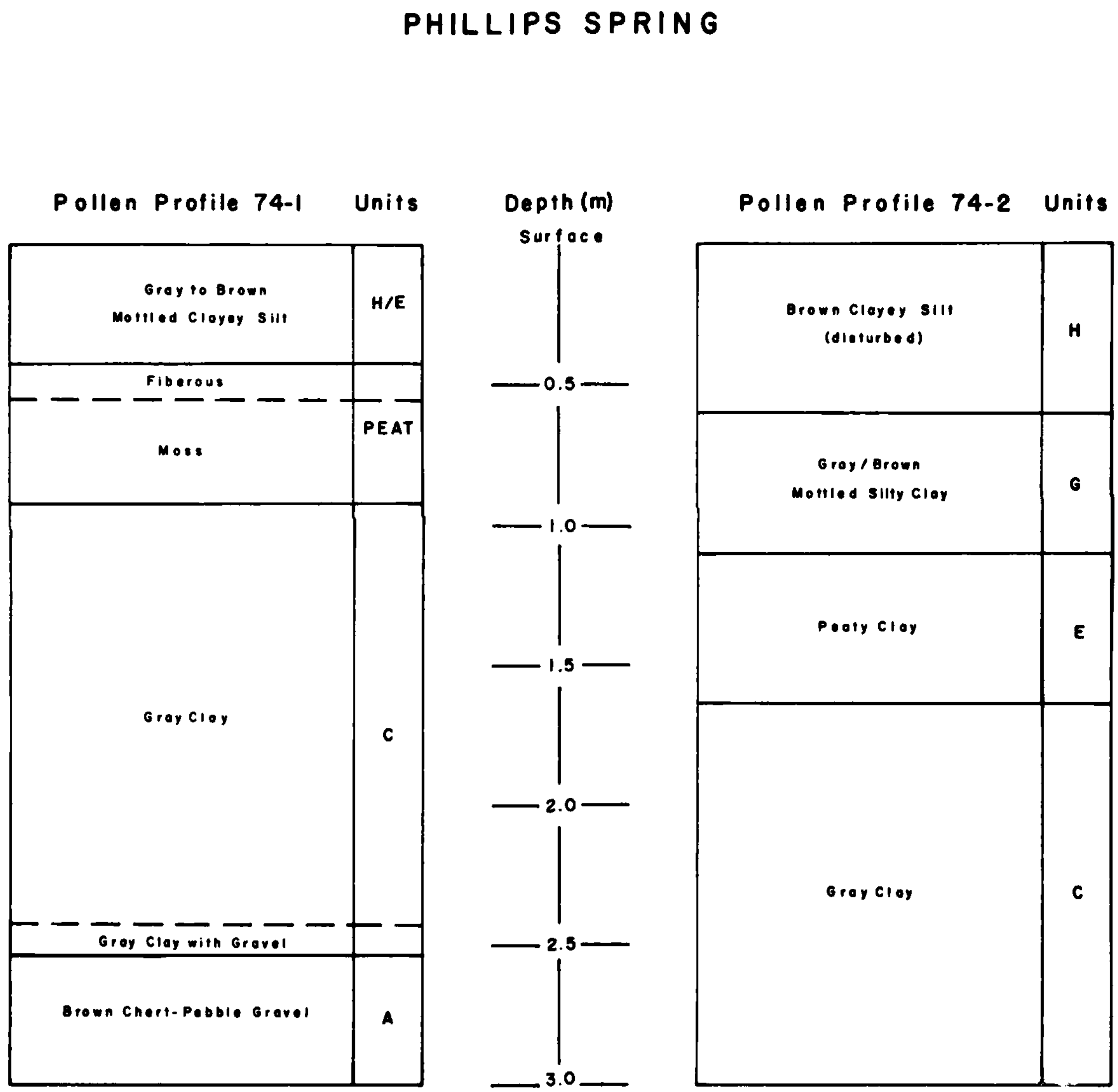

Figure 15.3. The stratigraphic sequence at Pollen Profile 74-1 and Pollen Profile 74-2.

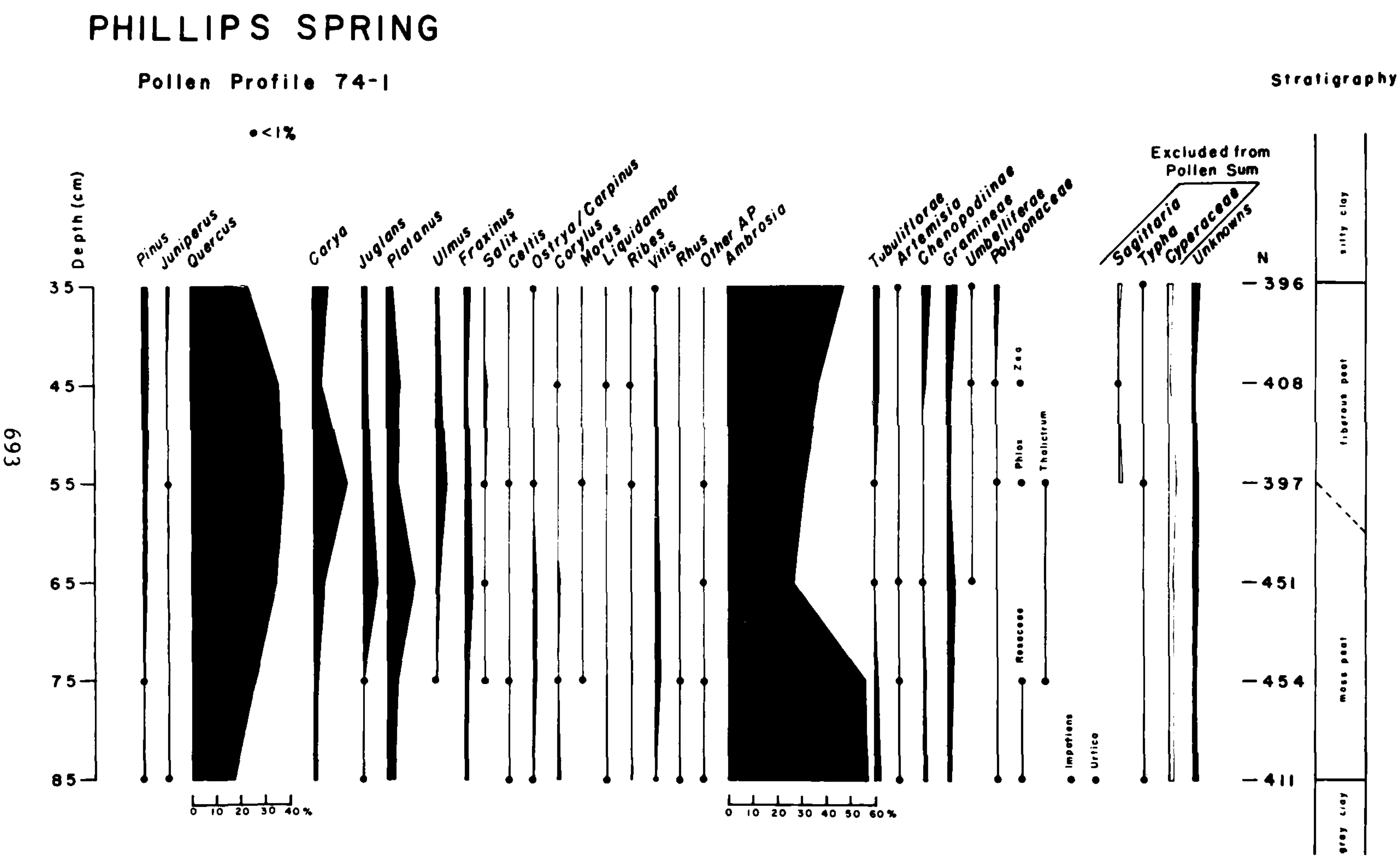

Figure 15.4. The relative pollen diagram from the peat unit in Pollen Profile 74-1.

of both the spring and the terrace has been sampled and processed from at least four locations. Because of its thickness, a large number of these pollen samples have been from unit C; however, with the exception of those ten samples from the peat lens in Profile 74-1, none of them contained sufficient pollen for analysis. Occasional grains were encountered in all of the sediments at Phillips Spring, especially units G and C, but their numbers were considered too low for analysis.

In palynology, the problem of contamination is greatly magnified when small pollen counts are derived from sediment samples containing low pollen concentrations (grains/unit sediment). No matter how carefully pollen samples are collected in the field and processed in the laboratory, it is reasonable to assume that a very small number of modern pollen grains are introduced into each sample. Thus, as the volume of processed sediment is increased in an attempt to increase pollen recovery, the probability that modern contamination will be counted as fossil grains also increases. These grains become part of the interpretative data base and can lead to erroneous conclusions.

Presently, in the midwestern United States, a mean of about 25,000 pollen grains are deposited per cm^2 per year on the landscape (Davis, Brubaker and Webb 1973). The numbers of grains per unit sediment (cm^3 or grams) is therefore a function of the number of years necessary to accumulate that unit. If a pollen record, reflective of the vegetation that produced it, is going to be preserved, the grains will occur in great abundance (i.e., years x units x 25,000 = first approximation). Thus, if a statistically meaningful pollen spectra is going to be recovered from a sample, the pollen concentration will be large. While it is always tempting to increase the sediment sample size to recover more pollen, any results must be viewed with suspicion. As a result, those units at Phillips Spring containing only occasional pollen grains were not processed further.

The three pollen samples collected during the initial testing of the site (1973) contained poorly preserved pollen in low concentrations. In view of the later investigations, these samples which were from unit C apparently were from local areas in which preservation of organics and pollen was slightly better than is usual for these alluvial clays. In spite of repeated attempts to relocate the zone represented by these samples, I have been unable to duplicate them or recover pollen for any additional samples in unit C both from within the spring basin and the terrace. On reflection, these few samples must represent fortuitous occurrences of pollen in the alluvial clay of the Pomme de Terre River; fortuitous also in that their presence lead to further research and discoveries at the site.

The peat lens within the spring contained abundant pollen both in the fiberous and mossy sub-zones (Fig. 15.3). However, in the sediment both above and below the short peat section, pollen was not present. The pollen from this peat section (Fig. 15.4) is dominated by oak (*Quercus*) and ragweed (*Ambrosia*). Oak is presently the dominant tree in the area and pollen studies from throughout the central midwest, in Iowa (Brush 1967, Van Zant 1976), Illinois and adjacent southeastern Missouri (King and Allen 1977; King in press) indicate it has dominated the region since the end of the Pleistocene.

The Phillips Spring pollen percentages are similar to modern pollen spectra from within the immediate area (King 1973:Fig. 4) and suggest that

any vegetational changes that have occurred since the deposition of the peat have been minimal. The percentages of the dominant plant species have not changed significantly during the intervening millennia. The high percentages of ragweed in Phillips Spring, which are usually associated with environmental disturbance are probably the result of frequent disruption of the floodplain environments during seasonal flooding of the Pomme de Terre River. Ragweed readily invades a flood scoured area. The increase in oak (*Quercus*), hickory (*Carya*), walnut (*Juglans*), and sycamore (*Platanus*), and the decrease in ragweed in the middle of the pollen diagram (65 cm) involves percentages that are within the expected values of normal community variation based on modern samples. Thus, in the absence of data to the contrary, this short pollen sequence is interpreted as reflecting a relatively uniform environment with no indications of pronounced climatic change. The pollen values suggest forest composition and inferred densities similar to the region today. The largest fluctuations in the pollen diagram are in ragweed and are probably reflecting changes in the floodplain environments. The presence of the pollen of aquatic plants such as Cyperaceae (sedge), *Typha* (cattail) and *Sagittaria* (arrowhead) in the sediments indicates that during deposition of the peat the spring supported a small pond.

Although no radiocarbon dates are presently available from the peat lens, dates from the adjacent units immediately above and below the peat suggest that it represents a stable interval of several thousand years duration. Radiocarbon dates from the top of unit E of 1990±50 B.P. (SMU-234), the base of unit E of 2910±50 B.P. (SMU-238), and the top of unit C of 3050±60 B.P. (SMU-235) suggest the age of the peat lens as mid-to-late Holocene. The radiocarbon dates from the large archaeological horizon within the site also support this chronological interpretation. [Editor's note: Date on moss from the lower part of the peat lens is 5392±86 B.P. (SMU-539).]

Of particular importance archaeologically was the occurrence of one grain of maize (*Zea mays*) from the 45 cm level in the upper part of the peat lens which suggests aboriginal maize agriculture at the site (Fig. 15.4). However, caution must be urged in interpreting this single grain as there is always the chance of contamination in any single grain occurrence. The Phillips Spring samples were field collected and processed in the laboratory under the assumption that the pollen of prehistoric cultigens might be present; therefore, maximum effort was made to eliminate known chances for contamination. When working with pollen samples from sites in which maize is chronologically possible, the samples must be treated with utmost care so that when these scare grains are found, they can be considered as probably occurring in place. Although it cannot be completely proved without macrofossils, it is my opinion that this grain probably is not the result of contamination and therefore possibly reflects aboriginal maize agriculture around the spring. In addition, the presence of squash seeds with associated plant materials dated at 4222±57 B.P. (SMU-483) has established Phillips Spring as a focus of similar agricultural activities. Early occurrences of maize in the midwest have been convincingly dated at 2000 radiocarbon years ago from a Hopewell site in south-central Illinois (Yarnell 1976). Unfortunately, this suggestion of possible maize at Phillips Spring was not confirmed despite reanalysis of these sediments and scanning for additional grains. Until

further evidence is presented for or against early maize in the Ozarks, this single grain occurrence for maize at Phillips Spring must remain a provocative and tantalizing hint.

DISCUSSION AND SUMMARY

The stratigraphy at Phillips Spring reveals sediments which have accumulated throughout the last 8000 years. These sedimentary units represent depositional cycles that can be correlated throughout much of the lower Pomme de Terre Valley. Unfortunately, they do not contain preserved pollen either at Phillips Spring or in correlated deposits at Rodgers Shelter and Boney Spring. Despite abundant pollen in the late Pleistocene sediments, the Holocene sediments apparently are devoid of palynomorphs. The primary reason for this is that while the Pleistocene deposits are composed of thick sections of peats, marls, and organic sediments developed *in situ*, the Holocene sediments are alluvial silts and clays that were deposited by the Pomme de Terre River. These alluvial sediments have never been found to contain sufficient numbers of pollen grains for analysis although they have been sampled and processed from a number of sites in the area.

The short Holocene pollen profile from Phillips Spring was not recovered from alluvial sediments but rather from peat which had developed in place within the spring. These peats contained abundant pollen while the adjacent alluvial organic clays did not. This peat unit represents a period of several thousand years when a small spring fed basin developed at the site and lead to the accumulation of peats.

The origin of these spring sediments is rather problematical. The stratigraphy of the spring basin (Figs. 15.2 and 15.3) is dominated by alluvial clays (units C and H) and contains no evidence of spring sediments older than the peats. Although the alluvial clays surrounding the site show the effects of continuous water saturation, no sand or gravel filled vertical spring conduits have been located in spite of the extensive trenching, archaeological excavations, drilling of water wells, and the numerous sediment cores collected in and around the basin (Fig. 13.2). This implies that a central spring conduit either does not exist or, if it does, it is so small and poorly developed as to not have been located. The absence of a well developed spring conduit coupled with the horizontal position of the units in the basin strongly suggests that the spring is of fairly recent origin and formed during the late stages of the deposition of unit C. Prior to its development, the spring probably issued elsewhere, possibly directly into the river near where its discharge channel exists today. The Holocene development of a new surface outlet for an Ozark bottomland spring has been documented at Koch Spring (Haynes 1976) and all of the springs investigated to date have contained evidence of repeated conduit migrations. This interpretation is further supported by the presence of thin traces of fine white sand throughout the spring suggesting that since its formation, the spring has been discharging through various small outlets and insufficient time has elapsed for the development of a main or central conduit. After the beginning of spring discharge at its current location, the peat unit developed *in situ* on top of unit C. The overlying stratigraphic units, H, E and G, post date the spring's development and thus reflect the shape of the small basin.

It is possible that peat accumulation could have continued until the spring was "cleaned out" and a larger basin created by Euro-American settlers in the last century. A low back-dirt rim containing 19th century artifacts bears witness to spring modification. These alterations could have removed all but the oldest of the accumulated peat. Mr. Phillips, the former landowner, once told me that several families depended on the spring for water during the droughts of the 1930's after their wells had dried up. More recently, with the general abandonment of the area due to the construction of the Truman dam and reservoir, disturbance of the spring has ceased and it again has been able to support a permanent and undisturbed aquatic plant community. The thin surface mat of aquatic mosses that was present when the spring was first tested was again starting to form a layer of partially decayed organic materials; peat development had started anew.

Unit H, which overlies the entire terrace and extends across the spring basin contains the abundant evidence of Euro-American activities and is essentially a disturbance unit. Its draped position across the spring (Fig. 15.2) suggests that it has accumulated in the basin as a result of farming activities. Figure 15.1 shows how closely the terrace has been plowed adjacent to the spring.

The stratigraphic, radiocarbon, and pollen evidence at Phillips Spring indicate that the main stratigraphic component of the terrace, unit C, was accumulating by 7900 B.P. and continued deposition until about 3000 years ago. Radiocarbon dates of 4240±80, 4310±70, and 4222±57 B.P. on archaeological features within the upper part of unit C indicate that the site was occupied during the final aggradation of this alluvial unit. Cultural artifacts occur frequently in the upper 15 to 20 cm of unit C. During this period, the spring must have discharged elsewhere in the immediate area as there is little geological evidence of spring activity at its current site. Directly on top of unit C, however, the peat lens presents the first evidence of a spring system at the site and the contemporaneous stratigraphic units are positioned relative to the newly formed spring basin.

The possible role of prehistoric peoples in the development of this spring should not be overlooked. The radiocarbon dates suggest their early activities preceed the development of the peat and many of the cultural features are located within the area presently saturated by the spring aquifer. Their activities could easily have converted a very small trickle into a much larger water flow merely by forcing an opening, following a seep down, through several meters of clay to the water saturated basal gravels. Once the new outlet was opened, spring discharge would have maintained and expanded it.

After the formation of the spring, by whatever means, peat accumulated in the shallow basin. The pollen contained in these peats does not show any significant vegetation changes that are interpreted as the result of major climatic shifts. Rather, the pollen records the uniform presence and minor fluctuations of the oak-hickory forest and herb communities along the lower Pomme de Terre River.

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CHAPTER 16

PRELIMINARY ANALYSIS OF BOTANICAL REMAINS FROM PHILLIPS SPRING

Frances B. King

INTRODUCTION

While it is generally necessary to disregard uncarbonized plant remains when they are found in archaeological sites because of the possibility of their being more recent contamination, we face a different problem in the examination of plant remains from sites such as Phillips Spring. Preservation of both carbonized and uncarbonized material is excellent and the real problem lies in separating archaeologically derived material from the natural seed rain of the site. As a result, we must rely on our knowledge of potential economic plants, including not only food plants, but also those that might have been used for medicine, crafts or ceremonial purposes, to determine the likelihood that a certain plant was being used. Table 16.1 lists the plant taxa recovered from Phillips Spring and their potential uses. Table 16.2 shows the season during which these plants were available and their habitat distribution (F. King 1976), and Tables 16.3 through 16.9 show their distribution within the site itself.

RESULTS

STORAGE PITS, UPPER SEDALIA COMPONENT

Table 16.10 shows Index of Similarity values between various pit features. Index of Similarity is a statistical measure widely used by ecologists to compare two or more populations (e.g., Curtis 1959). Index of Similarity (S.I.) equals $2w \div (a+b)$, where a = the number of taxa in one sample, b = the number of taxa in the second, and w = the number they have in common. The possible range of indices is from 0 for two entirely different populations to 1.0 for identical ones. Even though a few pits have unique taxa represented, the majority of the seed types are represented in most or all of the pits and the majority of pairs of pits have S.I. values greater than 0.50 (i.e., at least 50% of the plants are the same).

Several pits have obvious upper and lower fill units (392, 408 and 417). In addition, pit 961 underlies 424 and 927 underlies 414. It appears that there was more than one year of use of these pits, and that after the contents were finally removed, the pits were abandoned and proceeded to collect the natural seed rain of the site. The lower fill units might then be expected to reflect the nature of the storage contents and the upper fill units the natural environment of the site and the type of debris which might find its way into such pits.

The lower fill units have low S.I. values (Table 16.10) because of poor species representation and the random inclusion of various natural seeds in one pit or another. The S.I. values average 0.28 with

TABLE 16.1

Seeds and Nuts Recovered from Phillips Spring, Missouri
(Taxonomy based on Steyermark 1963)

Species	Phillips Spring 1974 (1)*	Phillips Spring 1976	Phillips Spring 1977	Boney Spring (2)*
CULTIGENS				
Cucurbita pepo (squash)	X[1]		X	X
Lagenaria siceraria (bottle gourd)			X	
NUTS				
Juglans nigra (black walnut)	X/C[1]	X/C	X/C	X
Carya spp. (hickory)	X/C	X	X/C	X
Corylus americana (hazelnut)	X/C		X/C	
Quercus spp. (acorns)	X/C	X	X/C	X
SEEDS - AQUATIC, SEMI-AQUATIC				
Scirpus sp. (bulrush)	X			X
Cyperus sp. (sedge)	X		X	
Carex spp. (sedge)	X		X	X
Carex cf. *hyalinolepis* (sedge)			X	
Ranunculus (buttercup)			X	X
Potomageton (pondweed)				
SEEDS - NON-AQUATIC WOODY PLANTS				
Sambucus canadensis (elderberry)	X	X	X	X
Vitis sp. (grape)	X/C	X	X	X
Parthenocissus cf. *quinquefolia* (Virginia creeper)			X	
Rubus sp. (blackberry, dewberry, raspberry)	X	X/C	X	X
Prunus americana (wild plum)	C		X	X
P. cf. *serotina* (black cherry)			X	
Platanus occidentalis (sycamore)			X	
Cornus sp. (dogwood)				X
Crataegus sp. (hawthorne)			X	
Smilax sp. (greenbriar)			X	
SEEDS - NON-AQUATIC HERBACEOUS PLANTS				
Oxalis sp. (sour grass)	X		X	
Bidens sp. (stick-tight)	X			
Impatiens sp. (touch-me-not)	X			
Phytolacca americana (pokeberry)	X		X	X
Helianthus cf. *mollis* (sunflower)	X		X	
Ambrosia trifidia (giant ragweed)			X	X

TABLE 16.1 (concluded).

Species	Phillips Spring 1974 (1)	Phillips Spring 1976	Phillips Spring 1977	Boney Spring (2)
A. artemisiifolia (common ragweed)			X	
Setaria (bristlegrass)	X		X	
Polygonum sp. (knotweed)	X			
Polygonum cf. *scandens* (false buckwheat)			X	
P. lapathifolium-type (smartweed)			X	
P. sagittatum-type (tear thumb)			X	
Desmodium sp. (tick trefoil)	X			
Amaranthus sp. (amaranth)	C		X	
Geum canadense (white avens)	X			
Daucus sp. (wild carrot)	X			
Viola sp. (violet)	X	C	X	X
Galium sp. (bedstraw)	C		C	
Verbena cf. *hastata* (blue vervain)			X	
Xanthium sp. (cocklebur)				X
Caryophyllaceae cf. *Silene* sp. (campion)			X	
Polygonatum sp. (Solomon's seal)	X		X	
Chenopodium sp. (lambsquarter)			X	

* (1) from Chomko 1976; (2) from King and McMillan 1975
[1] C = carbonized material present; X = uncarbonized material present

a range from 0.00 to 0.80. There is an average of four types of seeds or nuts in these lower fill units, and this is reflected in the S.I. values. All of the lower pit fills, with the exception of pit 392, have nuts of one or more kinds present in them.

The upper fill units have S.I. values ranging from 0.29 to 0.78 with an average of 0.55. The average number of taxa represented in the upper fill units is 9.3. The low S.I. values of pits 424 and 417 in comparison with pits 392, 415 and 935 derive from the absence of nut or acorn remains in pits 424 and 417 (Table 16.3). These pits also lack nut remains in the lower fill units and may have been dug for some other purpose than food storage or possibly they were emptied more completely.

If the upper and lower fill units within pits are compared, the average S.I. value is 0.31, with a range from 0.21 to 0.50. The average Index of Similarity value within the pits has approximately the same value as the average of the lower fill units, however the range is less, perhaps as a result of the larger number of taxa in the upper

TABLE 16.2

Potential Food Plants Recovered from Phillips Spring, Missouri
(Table based on data from King 1976)

Plant	Part Eaten	Habitat	Season
Amaranthus spp. (pigweed)	leaves, seeds	disturbed ground	spring (leaves) fall (seeds)
Ambrosia trifida (giant ragweed)	seeds	bottomland	fall
Carya spp. (hickory)	nuts	bottomland, oak-hickory forest	fall
Chenopodium spp. (lambsquarter)	shoots, seeds	disturbed ground	spring, fall, summer
Coryls americana (hazelnut)	nuts	oak-hickory forest, barrens	late summer, fall
Crataegus spp. (summer haw)	fruit	oak-hickory forest, open woods	fall, winter
Daucus pusillus (wild carrot)	roots	glades, prairie	spring, summer
Juglans cinerea (butternut)	sap (sugar), nuts	bottomland	fall, spring
Juglans nigra (black walnut)	nuts	oak-hickory forest, bottomland	fall
Oxalis spp. (violet wood sorrel)	leaves	glades, prairies, barrens	spring
Parthenocissus quinquefolia (Virginia creeper)	fruit, stalks	oak-hickory forest, ravines bluffs	fall, spring
Phytolacca americana (pokeweed)	shoots	disturbed ground/oak-hickory forest	spring
Platanus occidentalis (sycamore)	sap (sugar)	oak-hickory forest slopes, bottomland	spring
Polygonatum spp. (Solomon's seal)	rootstocks, leafy shoots	oak-hickory forest, bottomland barrens	spring, fall
Polygonum aviculare (knotweed)	seeds starvation food	disturbed ground	fall, winter
Polygonum pennsylvanicum (pinkweed)	seeds	swamps, sloughs, streams, gravel bar	fall
Potamogeton spp. (pondweed)	rootstocks	ponds and springs	?
Prunus spp. (wild plum)	fruit	oak-hickory forest	summer

TABLE 16.2 (concluded).

Plant	Part Eaten	Habitat	Season
Quercus spp. (oak)	acorns	oak-hickory forest, bottomland	fall
Rubus spp. (blackberry, raspberry, dewberry)	fruit	bottomland thickets	late summer
	leaves (tea)		fall
Sambucus canadensis (elderberry)	fruit	open woods, bottomland	late summer, fall
Scirpus validus (great bulrush)	rootstocks, pollen seeds	wet prairie, sloughs	spring, summer fall
Smilax spp. (catbrier, greenbriar)	rootstocks	glades, bottomlands, barrens thickets	spring, fall
	young shoots		winter
Verbena hastata (blue vervain)	leaves, seeds	bottomland, slough margins	spring, summer
Vitis spp. (grapes)	fruit	oak-hickory forest, glades, bluff areas	summer, fall

TABLE 16.3

Botanical Contents of Features, Phillips Spring

Species	Feature Number 393	897	1120	394	817	Total
Pit Number 392						
Vitis sp. (grape)	8u*	6u	4u			18u
Cucurbita pepo (squash)	1u	1u				2u
Lagenaria siceraria (bottle gourd)		1u				1u
Chenopodium sp. (lambsquarter)		1u	1u			2u
Polygonum spp. (knotweed, smartweed)	1u	5u,6c[+]	15u			21u,6c
Rubus spp. (raspberry, blackberry)	1u	6u				7u
Smilax sp. (greenbriar)	3u	4u				7u
Sambucus canadensis (elderberry)	2u	2u				4u
Viola sp. (violet)		6u	1u			7u
Verbena hastata (blue vervain)	1u	2u	1u			4u
Ambrosia trifida (giant ragweed)	1c,5u	7u	6u	1u		19u
Cyperaceae (sedge)	1u	10u				11u
Ranunuclus sp. (crowfoot)		1u				1u
Carya spp. (hickory)		Cala	CaCo			
	3.5u	5.1u	0.1u			8.7u
Juglans nigra (walnut)	0.1u	0.2u	0.1u			0.4u
Quercus spp. (acorns)			Quni			
	0.1u	8.5u	12.0			20.6u
Charcoal (weight)	69.0	77.5	9.7		0.5	156.7
Quercus (oak)	X	X				X
Carya (hickory)		X	X			X
Fraxinus (ash)	X	X				X
Populus/Salix (poplar/ willow)	X	X				X
Ulmus/Celtis (elm/ hackberry)		X				X
Platanus (sycamore)	X	X	X			X

*uncarbonized

[+]carbonized

units as well as mixing within the pits themselves.

The upper pit fills contain numerous taxa missing from the lower fills. These include grape, blackberry, greenbriar, vervain, crowfoot and sycamore.

TABLE 16.3 (continued)

Species	Feature Number 412	713	769	775	Total
Pit Number 408					
Vitis sp. (grape)		4u	2u	7u	13u
Rubus spp. (raspberry, blackberry)		6u	3u		9u
Smilax sp. (greenbriar)		1c			1c
Sambucus canadensis (elderberry)		1u	4u		5u
Phytolacca americana (pokeweed)				1u	1u
Ambrosia trifida (giant ragweed)		3u		4u	7u
Cyperaceae (sedge)	1u		12u	3u	16u
Gramineae (grass)			1u		1u
Ranunuclus sp. (crowfoot)		1u			1u
Platanus occidentalis (sycamore)			1u		1u
Carya spp. (hickory)	0.1c			CaOv	0.1c
	0.4u	10.0u	7.8u	24.2u	42.4u
Juglans nigra (walnut)		0.5u	3.3u	4.3u	8.1u
Quercus spp. (acorns)			BuO		
		4.0u	6.8u	25.0u	35.8u
Corylus americana (hazelnut)	0.1u	meat			0.1u
		0.1c			0.1c
Charcoal (weight)	8.9	12.4	14.6	13.4	49.3
Quercus (oak)				X	X
Carya (hickory)				X	X
Fraxinus (ash)	X	X		X	X
Ulmus/Celtis (elm/ hackberry)		X	X	X	X
Platanus (sycamore)		X			X
	768	808	777	789	Total
Pit Number 415					
Vitis sp. (grape)		1u			1u
Prunus sp. (plum)		1u			1u
Cucurbita pepo (squash)		1 frag			1u
Polygonum spp. (knotweed, smartweed)				1u	1u
Rubus spp. (raspberry, blackberry)		1u			1u
Sambucus canadensis (elderberry)				4u	4u
Carya spp. (hickory)				0.4u	0.4u
Juglans nigra (walnut)			0.2u	0.1u	0.3u
Quercus spp. (acorns)			0.1u	0.4u	0.5u

TABLE 16.3 (continued)

Species	Feature Number 768	808	777	789	Total
Pit Number 415 (continued)					
Charcoal (weight)	0.9	3.1	1.0	0.1	5.1
Quercus (oak)	X	X			X
Carya (hickory)	X				X

	418	419	420	806	813	Total
Pit Number 417						
Vitis sp. (grape)		7u				7u
Chenopodium sp. (lambsquarter)				1f[1]		1f
Rubus spp. (raspberry, blackberry)		3u				3u
Sambucus canadensis (elderberry)		3u				3u
Carya spp. (hickory)		0.1u				0.1u
				0.1c		0.1c
Quercus spp. (acorns)	0.6u					0.6u
Charcoal (weight)	0.1	5.2	0.5	0.4	0.1	6.3
Quercus (oak)		X				X
Juglans (walnut)		X				X
Populus/Salix (poplar/ willow)					X	X

	927	931	Total
Pit Number 927			
Vitis sp. (grape)	13u	3u	16u
Chenopodium sp. (lambsquarter)		1u	1u
Polygonum spp. (knotweed, smartweed)		1u	1u
Sambucus canadensis (elderberry)	3u		3u
Helianthus sp. cf. *mollis* (sunflower)		1u	1u
Galium sp. (bedstraw)	1c		1c
Ambrosia trifida (giant ragweed)	1u	1u	2u
Quercus spp. (acorns)	0.2u	0.1u	0.3u
Corylus americana (hazelnut)		0.1u	0.1u
Charcoal (weight)	1.8	0.1	1.9

	936	939	968	1012	Total
Pit Number 935					
Vitis sp. (grape)	1u				1u
Polygonum spp. (knotweed, smartweed)	2u		1u		3u

[1] f = fresh

TABLE 16.3 (continued)

Species	Feature Number 936	939	968	1012	Total
Pit Number 935 (continued)					
Polygonum aviculare			1u		1u
Rubus spp. (raspberry, blackberry)	1u				1u
Smilax sp. (greenbriar)	1u				1u
Sambucus canadensis (elderberry)	3u				3u
Helianthus sp. cf. *mollis* (sunflower)	1u		1u		2u
Cyperaceae (sedge)	60u		1u		61u
Ranunuclus sp. (crowfoot)			1u		1u
Carya spp. (hickory)	CaCo				
	1.0u		1.0u	0.1u	2.1u
			0.1c		0.1c
Juglans nigra (walnut)			0.9u		0.9u
Quercus spp. (acorns)	5.0u	0.1u	2.4u	0.1u	7.6u
Corylus americana (hazelnut)	0.1u			0.1u	0.2u
Charcoal (weight)	17.0	0.4	2.9	0.3	20.6
Quercus (oak)			X		X
Carya (hickory)			X	X	X
Juglans (walnut)	X				X
Acer (maple)	X				X

	P.N. 414 416	P.N. 424 971	P.N. 937 937	P.N. 961 962
Vitis sp. (grape)	8u	1u		5u
Rubus spp. (raspberry, blackberry)	5u	1u		
Sambucus canadensis (elderberry)	20u	1u	1u	
Verbena hastata (blue vervain)	9u			
Ambrosia trifida (giant ragweed)	1u			
Cyperaceae (sedge)	25u	3u		
Gramineae (grass)	1u			
Ranunuclus sp. (crowfoot)		1u		
Carya spp. (hickory)	0.5 u	0.9u		0.1u
Juglans nigra (walnut)	0.1u			
Quercus spp. (acorns)	0.1u	0.9u		0.1u
Charcoal (weight)		7.5	0.6	2.9

The most diverse assemblage of seeds occurs in pit feature 392 where, in addition to the previously listed taxa, squash, bottlegourd and violet also occur.

TABLE 16.4

Summary of Pit Features, Phillips Spring

Species	Pit Number 392	408	414	415	417	424	929	935	937	961
Vitis sp. (grape)	18u*	13u	8u	1u	7u	1u	16u	1u		5u
Prunus sp. (plum)				1u						
Cucurbita pepo (squash)	2u			1u						
Lagenaria siceraria (bottle gourd)	1u									
Chenopodium sp. (lambsquarter)	2u				1f*		1u			
Polygonum spp. (knotweed, smartweed)	2u 1c*			1u			1u	3u		
Polygonum aviculare								1u		
Rubus spp. (raspberry, blackberry)	7u	9u	5u	1u	3u	1u		1u		
Smilax sp. (greenbriar)	7u	1c						1u		
Sambucus canadensis (elderberry)	4u	5u	20u	4u	3u	1u	3u	2u	1u	
Helianthus sp. cf. *mollis* (sunflower)							1u	1u		
Viola sp. (violet)	7u									
Verbena hastata (blue vervain)	4u		9u							
Phytolacca americana (pokeweed)		1u								
Galium sp. (bedstraw)							1c			
Ambrosia trifida (giant ragweed)	19u	7u	1u				2u	1u		
Cyperaceae (sedge)	11u	12u	25u			3u		61u		
Gramineae (grass)		1u	1u		1u 1f					

*u = uncarbonized; c = carbonized; f = fragment

TABLE 10.4 (concluded)

Species	Pit Number 392	408	414	415	417	424	929	935	937	961
Ranunculus sp. (crowfoot)	1u	1u				1u		1u		
Platanus occidentalis (sycamore)		1u			1f					
Carya spp. (hickory)	8.7u	42.4u 0.1c	0.5u	0.4u	0.1u 0.1c	0.9u		0.1u 2.1c		0.1u
Juglans nigra (walnut)	0.4u	8.1u	0.1u	0.3u				0.9u		
Quercus spp. (acorns)	20.6u	35.8u	0.1u	0.6u		0.9u	0.3u	7.6u		0.1u
Corylus americana (hazelnut)		0.1u 0.1c					0.1u	0.2u		
Charcoal (weight)	156.7	49.3		5.1	6.3	7.5	1.9	20.6	0.6	2.9
Quercus (oak)	X	X		X	X			X		
Carya (hickory)	X	X		X				X		
Juglans (walnut)					X			X		
Fraxinus (ash)	X	X								
Acer (maple)								X		
Populus/Salix (poplar/ willow)	X				X					
Ulmus/Celtis (elm/ hackberry)	X	X								
Platanus (sycamore)	X	X								

TABLE 16.5

Botanical Remains from Second Sedalia Component

Species	1274	1275	1276	1277	1278	1279	1280	Pit Number 1173 1452	1453	1454	1455	1456	1457	1459	1468	1123	Total
Vitis sp. (grape)				1u*				2u		1u	1u+			6u	1u+	7u	19u
Cucurbita pepo (squash)		2u+			1u			3u+	2u	3u	6u+			5u	1f+		24u
Lagenaria siceraric (bottle gourd)														1u			1u
Polygonum spp. (knotweed, smartweed)								1c*								1c°	2c
															1u		1u
Rubus spp. (raspberry, blackberry)								3u		2u	4u			2u	4u	1u	14u
Sambucus canadensis (elderberry)		1u	12u		16u	6u	7u	10u	12u	11u	33u	2u	7u	20u	30u	1u	158u
								2c			1c						3c
Phytolacca americana (pokeweed)								2u						1u			3u
Galium sp. (bedstraw)								1c									1c
Ambrosia trifida (giant ragweed)																2u	2u
Cyperaceae (sedge)																10u	10u
Gramineae (grass)					1u			1u						1u			3u
									1c								1c
Crataegus sp. (hawthorne)								1c									1c
Carya spp. (hickory)														0.1u		0.2u	0.3u
Juglans nigra (walnut)	0.1u								0.1u					0.1u			0.3u
Quercus spp. (acorns)	0.1u	0.2u									0.1u						0.4u
Corylus americana (hazelnut)			0.1u														0.1u
Charcoal (weight)	2.1	6.7	33.3	15.4	21.9	7.9	11.7	28.6	19.4	31.5	37.6	4.3	7.4	31.5		14.0	252.6
Quercus (oak)			X	X				X		X	X		X	X			X
Carya (hickory)			X	X	X												X
Fraxinus (ash)				X					X		X						X
Acer (maple)				X	X			X	X		X	X	X				X
Populus/Salix (poplar/willow)			X					X									X
Ulmus/Celtis (elm/hackberry)			X		X			X			X		X				X
Platanus (sycamore)			X					X		X	X			X			X

* u = uncarbonized; c = carbonized

\+ fragments

° lapathifolium type

TABLE 16.6

Botanical Remains Below Second Sedalia Component

Species	1502	1526	1639	1649	1640
Vitis sp. (grape)	1c*				
	862u*				25u
Cucurbita pepo (squash)	125u				1 frag
Lagenaria siceraria (bottle gourd)	14u				
Chenopodium sp. (lambsquarter)	1c				
Polygonum spp. (knotweed, smartweed)	2u				3u
	2c				
Rubus spp. (raspberry, blackberry)	13u				
Sambucus canadensis (elderberry)	36u				9u
Phytolacca americana (pokeweed)	8u				2u
Galium sp. (bedstraw)	1u				
	2c				
Ambrosia trifida (giant ragweed)	1u				1u
Cyperaceae (sedge)	12u				
Gramineae (grass)	1c				1c
	1u				
Potamogeton sp. (pondweed)	3u				
Carya spp. (hickory)	21.3u				
	0.1c				
Juglans nigra (walnut)	44.7u		2.2 (1.2 walnut)		
Quercus spp. (acorns)	9.2u				0.1u
Corylus americana (hazelnut)	0.1u				0.1u
Charcoal (weight)	173.7	0.1			
Quercus (oak)	X				
Juglans (walnut)	X				
Acer (maple)	X				
Populus/Salix (poplar/willow)	X				
Ulmus/Celtis (elm/hackberry)	X				
Platanus (sycamore)	X				

* c = carbonized; u = uncarbonized

Of all the pits, only 392 and 408 contain large quantities of nuts that might indicate their status as storage pits which were not completely emptied. The nut remains in pit 392 occur in the upper fill unit suggesting that this was a second use of the pit. Along with the nuts, squash and gourd seeds were evidently also stored in pit 392. The nuts in feature 408, on the other hand, occur in the lower fill unit and may represent an earlier cycle of use of the pits.

The presence of seeds representing semi-aquatic to lowland habitats such as grape, lambsquarter, knotweed, sedge, elderberry, sunflower, vervain, pokeberry, ragweed, and crowfoot suggests that many of these pits were open during the summer or were abandoned empty or partially

TABLE 16.7

Botanical Remains from General Levels

Species	332	334	338	352	387	396	766	776	784	915	928	1119	1123
Vitis sp. (grape)											1c* 4u*		9u
Cucurbita pepo (squash)										2u	+		
Polygonum spp. (knotweed, smartweed)										1u	1u		
Rubus spp. (raspberry, blackberry)										1u	1u		1u
Sambucus canadensis (elderberry)													3u
Phytolacca americana (pokeweed)											1u		
Galium sp. (bedstraw)													1u
Ambrosia trifida (giant ragweed)										2u	1u		1u
Cyperaceae (sedge)									1u		3u		1u
Gramineae (grass							1F°	1u		1u	7u		2u
Platanus occidentalis (sycamore)							1F						
Carya spp. (hickory)	0.1u											0.1u	0.2u
Juglans nigra (walnut)	0.1u												
Charcoal (weight)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1		3.3	0.10	14.0

* c = carbonized; u = uncarbonized
\+ = fragments
° F = fresh

TABLE 16.8

Miscellaneous Feature Charcoal Samples

Species	Miscellaneous Features								Charcoal Samples		
	206	459	413	781	786	787	788	796	214	215	225
Vitis sp. (grape)								2u*			
Rubus spp. (raspberry, blackberry)			1u		2u						
Smabucus canadensis (elderberry)					1u						
Ambrosia trifida (giant ragweed)			2u								
Cyperaceae (sedge)			1u								
Gramineae (grass)			2u								
Carya spp. (hickory)								3.1u			
Juglans nigra (walnut)								0.1u			
Quercus spp. (acorns)								0.1u			
Charcoal (weight)	0.1	9.8	1.7	0.1	0.5		0.5	2.6	0.1	0.1	0.1

* u = uncarbonized

TABLE 16.9

Botanical Remains from Domestic Floors

		Species				
Pit No.	Excav. Unit No.	*Vitis* spp. (grape)	*Carya* spp. (hickory)	*Quercus* spp. (acorns)	*Corylus americana* (hazelnut)	Charcoal (wt)
1124	824					0.4
	826					0.1
	827					1.0
	1124			0.1u*		
	1135					0.1
	1139					1.0
	1166		0.1u	0.1u	0.1u	
	1169					0.1
	1172					0.1
	1188				0.1u	
	1189		0.1u			0.1
	Total		0.1u	0.2u	0.2u	2.9
1127	1206				0.1u	0.1
	1128					0.1
	1243					0.1
	Total				0.1u	0.3
1125	1187	1c*				0.1

* u = uncarbonized; c = carbonized

empty such that they had accumulated the natural vegetation of the spring. Unlike the widely dispersed pollen grains, most plants have rather localized "seeds rains." When one examines the list of taxa occurring at Phillips Spring, there is an amazing diversity. This diversity suggests a thicket as much or more than it suggests an open habitation site.

Figure 13.2 shows an elongated depression running from the spring toward the northeast. Within this depression, and adjacent to the spring, lies a smaller shallow basin. This basin lies in squares 510-511SE506 and is at least 25 cm lower than the surrounding field. The area around the spring has been disturbed greatly, as has the spring itself. However, if this depression is not an artifact of historic activity around the spring, an assumption that cannot be proven, but instead represents the older landscape, it would do a great deal to explain the semi-aquatic plants recovered from nearby pits since it might have been filled with water in earlier times.

The historic Osage planted crops in April and left in May for the summer hunt, returning in August about the time the crops began to mature. Food was stored at this time and the tribe left the village for the fall hunt for deer and bison, returning about the end of December. During the next weeks they would live off the stored food and whatever game they could

TABLE 16.10

Index of Similarity Values for Phillips Spring Pit Features

	U392	L392	U408	L408	414	927	U415	L415	U417	L417	424	961	U935	L935	937
U932		0.12	0.69	0.52	0.69	0.48	0.52	0.32	0.38	0.12	0.48	0.32	0.64	0.22	0.12
L932			0.14	0.25	0.18	0.20	-0-	-0-	-0-	-0-	-0-	-0-	0.20	-0-	-0-
U408				0.50	0.78	0.43	0.50	0.25	0.55	0.14	0.55	0.37	0.64	0.27	0.14
L408					0.70	0.37	0.57	0.20	0.33	0.25	0.33	0.60	0.75	0.44	-0-
414						0.42	0.59	0.31	0.75	0.18	0.53	0.46	0.63	0.33	0.18
927							0.25	0.50	0.29	-0-	0.28	0.33	0.56	0.18	0.20
U415								0.20	0.50	0.25	0.33	0.60	0.50	0.44	-0-
L415									0.25	-0-	0.25	0.33	0.33	0.40	0.50
U417										0.33	0.60	0.25	0.29	0.29	0.33
L417											-0-	0.50	0.20	0.66	-0-
424												0.25	0.43	-0-	0.33
961													0.50	0.80	-0-
U935														0.36	-0-
L935															-0-

find in the vicinity of the village, going on a spring hunt for bear and beaver during February and March. They would again return in April to do the planting (Chapman 1959:15-16). Prior to 1720 when horses became available and the Plains Indians began to drastically influence the Osage, there probably was greater emphasis on agriculture and less on hunting (Chapman 1959:15). At least in the early 1800's, the crop was cultivated only once, in May just before the summer hunt commenced.

Considering the movements of the historic Osage, and assuming that similar patterns may have been equally advantageous in earlier times, there were three periods during which the area adjacent to Phillips Spring was probably occupied. These would be sometime around January-February, April, and August. In April, crops would be planted; in August, cultivataed and non-cultivated plant foods stored; and in January-February, they would be consumed.

The pits at Phillips Spring show what might be interpreted as the same type of seasonal usage as later Osage might have given them. The pits were probably dug and filled in the fall, since that is the time when nuts are available and few extraneous seeds seem to have been included. The most likely time for the pit contents to be consumed, based on ethnohistoric accounts and the availability of food resources would be early spring. Some of the pits have sand lenses which suggest either high spring discharge or river flooding of the site after the pits were emptied which might have most likely occurred during the spring runoff. Not all of the pits have sand lenses, however, and perhaps they represent another cycle of use when the site did not flood.

If a surplus of nuts were stored, it would not have been a waste of the energy it took to collect them if they were left in the ground a second season. Under proper storage conditions, black walnuts, for example, can be stored in a pit for up to four years without significant loss in germination capability (USDA 1974:457). Both black walnuts and hickory nuts display a dormancy which makes such long term storage possible. Oaks have less dormancy and some, especially white oaks, germinate almost immediately. Acorns of the black oak group germinate the following spring. Hazelnuts could be stored at least a year without loss of germination ability, which would, of course, precede decay and inedibility (USDA 1974:344).

The volumes of nuts that could be stored in the various Phillips Spring storage pits are shown in Table 16.11. The pits could hold enough relatively high energy hickory nuts to maintain a minimum level of 1000 calories per day for twelve people for a month without other food sources, or six people on acorns for a similar period.

It would be foolhardy to say that was the size of the group visiting the spring. There may have been more or less people for a longer or shorter period of time relying to some unknown extent on other resources. As has been discussed above, the pits may have remained filled for longer than one winter as well.

SECOND SEDALIA COMPONENT AND SQUASH AND GOURD ZONE

The large rock lined pit (Feature 1173) has many elderberry seeds (Table 16.3) as well as grape, blackberry, ragweed, sedge and grass. The floral component of this feature is similar to that of the pits discussed

TABLE 16.11

Estimated Food Value of Phillips Spring Storage Pits if Filled to Capacity*

	Nuts			
	Black Walnuts	Hickory Nuts	Acorns	Hazelnuts
Calories per pound (in shell)	627	1068	450[1]	1323
Calories per pound (edible portion)	2849	3053	1125	2876
Pounds Whole Nuts per Bushel	44[2]	441	100	35
Total Pounds Accommodated by Storage Pits[3]	350	350	435	275
Total Calories Represented by Storage Pits	219,450	373,800	195,750	363,800
No. of Individuals Supported for one month at a level of 1000 calories per day	7	12	6	12

[1]Estimated on the basis of comparisons with hickory and hazelnuts.

[2]Estimated on the basis of similar size of black walnuts

[3]Total volume of storage pits = 227 liters = 7.9 bushels.

*Based on Asch *et al.* 1972:Table 5; Watts and Merrill 1963; USDA 1974.

earlier and seems to reflect a plant community that may well have existed around the spring. There are some squash and bottlegourd seeds and charcoal. Elderberries from Feature 1173 represent at least thirty fruits, some of which are charred. Elderberries are edible, having 72 calories per 100 grams (Watts and Merrill 1963) and probably were eaten to some extent by the aboriginal inhabitants of the area surrounding Phillips Spring.

In contrast, Feature 1502, the unit lying below the rock-lined pit (i.e., Squash and Gourd Zone) contains numerous squash and gourd remains and also a large number of grape seeds, probably representing a cache, as well as a fairly large amount of hickory, walnut, and acorn. Feature 1502 contains the same indicators of the spring environs as do the other pit features such as sedge and ragweed.

CULTIGENS

Although squash remains occur in several younger features, they are abundant in only the Squash and Gourd Zone discussed in Chapter 13. There are both squash and bottle gourd seeds from this component as well as bottle gourd rind. In addition, there are two digging tools. Although no culturally diagnostic artifacts were recovered from this level, it has been radiocarbon dated at 4222±57 B.P. and represents the Late Archaic Period.

The preservation environment at Phillips is excellent and it might be assumed that the presence of early cultigens is a natural reflection of their abundance at the site. For this reason, we might also predict similar finds around some of the other springs in the western Ozarks. However, the occurrence of aquatic pondweed (*Potomageton* sp.) in the squash and gourd zone suggests that preservation was due to a sudden increase in spring discharge or stream flooding, which may have buried or submerged squash and bottle gourd seeds that were cached for planting the following year. At nearby Boney Spring, the base of the surface peat zone was dated at 4200 B.P. (King 1973), the same approximate age as the squash, and it was felt that this probably marked the last time Boney Spring, which lies considerably higher than Phillips, had been flooded by the Pomme de Terre River. At Phillips, a rock-lined, basin-shaped pit was later constructed above the layer containing the squash and gourds, effectively sealing the layer.

Squash seeds also occur in horizons or features tentatively dated at 4000 and 3000 B.P. Squash had previously been recovered from a storage pit at Boney Spring (King and McMillan 1975) which was dated at 1920±50 B.P. Bottle gourd remains were also recovered from the most recent horizon (730 B.P.) of nearby Blackwell Cave (Falk 1969:77). Thus, it appears that squash and probably bottle gourd were cultivated in the western Missouri Ozarks throughout much of the last 4000 years.

During the excavation, numerous squash seeds were found lying on what appeared, at the time, to be a badly decomposed leather. Microscopic examination and chemical analysis showed that this material was actually the remains of a large mussel shell. Figure 16.1 shows a photograph of the mussel shell in cross section and a drawing (Fig. 16.2) of the structures seen based on Pennak (1953). On the inner surface of the shell, thin laminae of calcium carbonate alternate with an organic substance to produce the nacreous or mother-of-pearl layer (nacre). Between the nacre and the outer horny epidermis or periostaceum lies the prismatic layer consisting of closely packed prism-like blocks of calcium carbonate (Pennak 1953:695). These structures are very clear in Figure 16.1 despite the degraded nature of the shell.

In addition to seeds of squash and gourd, there are also numerous fragments of rind. Microscopic examination of the rind and thin sections comparison with rinds of known specimens of squash and bottle gourd and with Cutler and Whitaker (1961:Fig. 5) show that the rind specimens recovered are of bottle gourd.

Historically, whole squash were stored, as well as dried squash and seeds saved for cultivation the following year. Squash was frequently eaten while immature and such squash would leave no durable seeds or rind that might possibly be preserved. Squash seeds were also eaten and have

Figure 16.1. Cross-section of Mussel shell from Phillips Spring, Missouri.

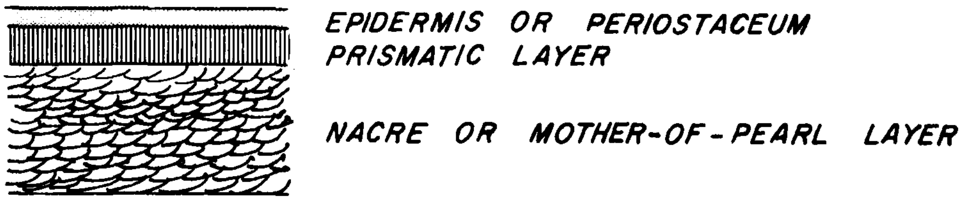

Figure 16.2. Diagram of mussel shell showing various layers.

a relatively high food value. The presence of squash remains at Phillips Spring suggests the seeds had been stored for planting the following year. The apparent storage of some seeds in a mussel shell supports this interpretation. Bottle gourd was used as dippers or containers and frequently was allowed to dry in storage (Cutler and Whitaker 1961). The presence of all parts of bottle gourds at Phillips suggests that whole fruits were initially present at the spring.

The Phillips Spring squash as well as the similar seeds from Boney Spring have been identified by Dr. Hugh Cutler of the Missouri Botanical Garden as resembling the cultivar "Mandan" extensively grown by historic tribes of the northern plains. "Mandan" squash is a small green and cream colored pumpkin with relatively short and broad seeds (Will and Hyde 1917; Gilmore 1919; Cutler 1967).

The squash seeds in the "Squash and Gourd Zone" range from 8.1 to 12.8 mm in length and from 5.4 to 8.7 mm in width. The bottle gourd rinds range from 1.3 to 2.4 mm in thickness. The bottle gourd rind is somewhat thinner than that from Salts Cave (3.2-6.5 mm); however, the Salts Cave material is thicker and woodier than most specimens found north of Mexico (Yarnell 1969:51).

DOMESTIC FLOOR, WOOD POST AND WOOD SAMPLES AND GENERAL LEVEL SAMPLES

Other types of features including domestic floors and general level samples have few seeds or nuts or charcoal. This may reflect differing uses in the case of the living floors or the scarcity of material outside the pit features. However, all of the domestic floors are a minimum of 7 to 10 meters from the spring compared to a range of 1.2 to 5 meters for the pits containing plant materials. Also, the general level samples taken within three meters of the spring contain preserved plant material. Assuming that some plant remains would be blown or washed onto almost any surface, it is likely that the lack of preserved plant material from outside the immediate spring locality is due not so much to lack of initial presence, as to poor preservation.

Wood post, Feature 453 (Chapter 13), is a large piece of wood belonging to the "white oak group", probably either bur oak or white oak. Two smaller pieces from the Squash and Gourd Zone are roots of either ash or maple.

Squash or gourd remains occur in two levels below the Squash and Gourd Zone in Square 510SE508. Sample 1639 contains a fragment of bottle gourd rind and sample 1640 a squash seed fragment. These levels date considerably earlier than 4300 B.P.; however, the small size of the cultigen remains recovered and their proximity to a root canal or rodent burrow indicates that these materials are probably contamination from the Squash and Gourd Zone.

CHARCOAL

Identified wood charcoal from Phillips Spring is composed primarily of the following types: oak, hickory, walnut, ash, maple, poplar or willow, elm or hackberry, and sycamore (Table 16.3). Without exception, these taxa are representative of the streamside or bottomland forest community. Whether the distribution of bottomland prairie is controlled by

fire or by edaphic conditions (Chapter 2), or both, it is probable that the floodplain in the vicinity of Phillips Spring has always in the recent past been forested. The site lies on the east, protected, side of the river and the soil is developed on the somewhat more porous Rodgers alluvium in contrast to the Breshears Valley which is underlain by the relatively fine-grained Koch formation (Haynes 1977).

Although it is not possible to reconstruct forest structure or degree of usage of various taxa from preserved charcoal because of problems of differential preservation due to hardness, we might make a few interesting points. Features 1173, the second Sedalia component, and 1502, the underlying Squash and Gourd Zone, contain maple while only one of the younger pit features does so. Most of the maple appears to be silver maple which is primarily a stream bank species, so that its occurrence might be more limited than that of the more mesic species such as oak, hickory, or ash. As a result, less silver maple might be available in the vicinity to use for firewood and it might be depleted more rapidly and result in increased use of other floodplain species.

DISCUSSION

The plant remains recovered from Phillips Spring are primarily indicative of the late summer-fall seasons and bottomland habitat. Many are representative of plants with edible parts, and, as such, these plants probably formed at least a minor part of the diet of the Indians who camped at the spring. Native cultigens such as sunflower or marsh-elder are absent, although both occur at other sites in Missouri (Heiser 1954, Yarnell 1972, Steyermark 1963). The most interesting and significant botanical remains from Phillips Spring are the remains of squash (*Cucurbita pepo*) and bottle gourd (*Lagenaria siceraria*) in horizons dated as old as 4200 B.P. These squash and gourds are some of the oldest yet recovered in eastern North America.

Despite the absence of potential native cultigens, archaeological and ethnological evidence from other areas suggests that the Indians had close relationships with many of the plant species found at Phillips Spring including knotweed, pokeweed, grape, ragweed and plum. The Indians who first cultivated squash and bottle gourd at Phillips Spring must have had much previous interaction with the plant community and probably had at least passively selected for certain wild plants in their environment. For example, burning promotes the establishment of many nut and fruit producing species such as hazelnuts, blackberries and plums (F. King 1978). At the same time, the more open canopy that might result from either burning or firewood procurement would increase the productivity of the remaining trees which might include such types as oaks, hickories, acorns, pawpaws and plums. There is also ethnographic evidence that some wild plants were transported from place to place even though they were not cultivated. For example, wild plum (*Prunus americana*) thickets quickly grew up around Pawnee earth lodges in Oklahoma after the Pawnee had moved there from Nebraska. Plum were frequently dried without pitting and the pits ultimately discarded and sprouted (Gilmore 1919:8). It has long been felt that the domestication of some native plants preceded the arrival in the east of cultigens. The presence of squash and bottle gourd at Phillips Spring as well as at

sites in Kentucky (Marquardt and Watson 1977, Chomko and Crawford 1978, Yarnell 1976) and eastern Tennessee (Chapman and Shea 1977) indicates that this was not the case and that cultigens were present in the east at approximately the same time cultivation of native plants was being tried. Yarnell (1976) feels that if a direct relationship did not exist between the early sequence of plant husbandry in the east and the southwest, there may have been other factors in these regions that made the people receptive to innovations that would lead to substantial changes in their basic subsistence patterns. In the same way, other factors such as topography, climate and subsistence specializations were responsible for reducing rates of subsequent cultigen transmission within the eastern United States.

Wright (1976) provides evidence to suggest that, at least in the Near East, climatic change actually set the stage for plant domestication by producing optimal environmental conditions. Climatic, geologic, biologic, and cultural conditions were all favorable for the first time in a single time and place for the domestication of plants; namely, wheat and barley.

The Holocene of North America was a period of considerable climatic variability as well as cultural change. McMillan (1976) believed that vegetational change during the Holocene had a pronounced effect on the past human populations in western Missouri and accounts, in part, for the changes in subsistence and settlement strategies seen in the archaeological record. The period during which plants first seem to have been cultivated in the midwest, approximately 4000 years ago, coincides with the return of more favorable climatic conditions following the mid-Holocene dry period or "Hypsithermal" (king and Allen 1977). Hypsithermal climatic changes had their greatest effect on the western border of the eastern deciduous forest where conditions were already marginal for forest occurrence. With the drier climatic conditions, the forest opened up to create a mosaic of open woodland and prairie with forest maintaining its integrity only in the bottomlands. It is probable that in such an area of environmental change, cultural adaptation must also have been at a maximum as forest inhabitants strove to survive in an increasingly prairie dominated environment. Changes in the related availability and distribution of plant and animal resources in different habitats resulted in greater emphasis on the bottomland habitat (McMillan 1976) and may have been instrumental in creating a more sedentary way of life as the impetus to exploit other habitats was diminished. At the same time, settlements in the rich and fertile bottomlands were well adapted for subsequent attempts at cultivation.

It will probably never be possible to determine precisely what factors were responsible for the adoption of cultivated plants in eastern North America. And, in fact, the cause may vary from environmental stress to population stress or even cultural evolution, depending on the site. However, climatic changes of the Holocene were of sufficient magnitude in western Missouri to severely alter the environment and must have forced changes in subsistence-settlement patterns in response. We may have recorded the evidence of just such an adaptation at Phillips Spring.

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CHAPTER 17

PROJECT EVALUATION AND SUMMARY

Marvin Kay

The results of this lower Pomme de Terre River valley research include: (1) monitoring Holocene environmental/climatic change and (2) its impact, or the lack of it, on settlement; (3) measuring site usage, seasonality, stylistic and functional variability in cultural assemblages from Rodgers Shelter and Phillips Spring; and (4) cultural taxonomy and tradition of the western Ozark Highland.

HOLOCENE ENVIRONMENT AND CLIMATE

Changes in landscape, its affect upon and interaction with human prehistory are central themes of this research. The depositional record of Rodgers Shelter illustrates the dynamics of Ozark Highland environments, with the Rodgers terrace sediments viewed as direct responses to changes in rates of stream flow, overbank alluviation and hillslope erosion. It is hypothesized that the main factor in changes of regional landscape was climatic; the impact of burning, grazing or browsing pressures, and human habitation was of an ancillary nature. Other contributing data include the analyses of vertebrate and invertebrate faunas, the early Historic period (i.e., 1830's) G.L.O. vegetation models and the still scanty pollen evidence from Phillips Spring. Though I recognize certain deficiencies in these data, particularly with pollen coverage, and anticipate limitations in diachronic projections of the vegetation models, there is now sufficient information for a model of changing Holocene environments for the lower Pomme de Terre locality, as follows.

In geologic terms the onset of the Holocene marked an abrupt transition in the biota of this area, with an early decline of boreal forest vegetation and fauna including elements now seen only in northern Canada or that became extinct. Relative to present environments the early Holocene, circa 10,500 B.P., was one of cooler, moister climates which supported a more mesic deciduous forest and an essentially modern fauna. Hill crests and valley slopes were mantled with loess and there were few bedrock exposures, though reworked chert gravels were common in the river beds. After a period of down cutting prior to 10,500 B.P., the Pomme de Terre River began a cycle of rapid aggradation that continued until about 7500 B.P. during which some four to five meters of alluvium (consisting of reworked loess) were added to the floodplain; the most pronounced deposition occurred until about 8100 B.P. and effectively sealed individual Dalton and earliest Archaic living floors under what is now as much as nine meters of sediment. After, say, 9000 B.P., hillslopes became more subject to erosion and bedrock outcrops became common.

Hypsithermal conditions began to be felt by about 8300 B.P., when the first tall grass prairie fauna is noted at Rodgers, and persisted until at least 5200 B.P. though prairie species were present until at

least 3600 B.P. This period witnessed reduced annual precipiation, a lengthening of the growing season though mean January and June temperatures, as judged from Rodgers gastropod studies, were similar to present. Concomitant changes in stream flow occurred and fish taken from the Pomme de Terre River are slack or backwater denizens; except for an occasional deep spring-fed pool the river may have dried up entirely during prolonged droughts; probably even during the best of times the Pomme de Terre was a sluggish stream that repeatedly meandered across a floodplain mosaic of prairie and forest. Our most impressive record of the Hypsithermal is clinal variation in small mammals that follow the river skirting forests of the Ozark Highland into the tall grass prairies; present day analogues to the interval from about 7500 to 6300 B.P. occur in eastern Kansas, a considerable distance to the west. The major vegetation zones common today were greatly telescoped in extent; undoubtedly more zeric species were favored and the composition and phytogeography of oak-hickory forest, oak barrens and prairie were greatly changed. Upland vegetation must have sustained increased stress as a product of less available moisture or fire that favored prairie expansion; probably floodplain gallery forests contracted. Although speculative, it seems likely habitat requirements of deer were largely unmet and that in this locality they became less available as a prey species. In sum, the Hypsithermal represented a dramatic climatic shift that conceptually at least may be considered as a "barrier" segmenting more-or-less discrete Holocene environmental episodes.

Changes in landscape were no less remarkable. A paleosol developed on the Rodgers terrace, or Terrace-lb, indicating that the alluvial landscape began to stabilize sometime after 8100 B.P. Our best estimate of the age of this Hypsithermal soil is from about 8000 to 6300 B.P., after which it was buried by coarse alluvial fan deposits. This soil development was punctuated by Terrace-lb downcutting at 7500 B.P. which indicates either a lowering of the river level or a local retrenching of the floodplain by a river meander. In either case the subsequent channel fill marks a continuation in overbank alluviation of finer silt and clay sized particles that began after 8100 B.P.

After the pronounced deflation of upland sediments prior to 8100 B.P., hillslope erosion added but small increments of coarse fan materials until 6300 B.P. Subsequent hillslope erosion until about 3600 B.P. was severe, of magnitudes without parallel in the Holocene, leading to upland bedrock exposures denuded of soil. At least three episodes of hillslope erosion are defined at Rodgers Shelter though their deposition was not synchronous over the length of the site adjacent to the bluff: A coarse alluvial fan emanating from the east hollow began to cover the shelter area after 6300 B.P. whereas fan deposits originating from the hollow west of the shelter did not begin to flow until after 5200 B.P. The uplands on either side of the shelter constitute two separate small drainage nets of variable slope and area and they may have experienced diachronically differential use that accentuated the effects of hillslope runoff. Leaving for the moment the cause or causes, hillslope runoff and erosion increased late in the Hypsithermal and created the edaphic conditions of the upland vegetation recorded in the General Land Office surveys.

It is doubtful that the major rainfalls that produced the runoff

were of greater magnitude than previously experienced; even today it is not uncommon for a thunderstorm to dump from six to eight inches of rain within a period of a few hours causing local flash flooding. What made these rains devastating was impoverished slope vegetation that led to rapid stripping of slope sediments and deposition of about a meter of alluvial fan gravels at the toe of hillslopes. Two factors may have operated in concert locally above Rodgers Shelter: (1) initially accentuated by human habitation, use of slope areas and exploitation of upland plant resources, and (2) the area could have experienced a prolonged drought that greatly weakened slope vegetation. A second hypothesis is that hillslope degradation resulted only from climatic variables, in which case one should anticipate regional occurrence of buried coarse alluvial fans wherever hillslope topography permits and no correlation with previous nearly Hypsithermal habitation sites. As yet, there is an insufficient number of such sites to evaluate which idea is most plausible.

From the limited Phillips Spring pollen data we know that valley vegetation after 3300 B.P. was similar to today in composition and that vegetative changes are within the range of modern variation. Nonetheless, "recovery rates" of the post Altithermal biota as expressed in small mammal clines from Rodgers Shelter accord a seemingly more precise model of subsequent environmental change. Forms from 3600 to 1000 B.P. were apparently adapting to slightly more mesic conditions than previously but were still more zeric than the present day setting; even the modern record is more zeric than the pre-Hypsithermal Rodgers fauna. The Hypsithermal did not end abruptly but rather witnessed a gradual transition to more mesic conditions, a process that continues today.

The shift to more mesic conditions brought about a westward expansion of deciduous oak-hickory forest along the western flank of the Ozark Highland. Compositional differences in the forest coincide with the underlying bedrock types that afford variable topography and hydrologic regimes. Upland prairie outliers were similarly controlled and remain mainly in tablelands underlain by either Mississippian age limestones or Pennsylvanian age shale and sandstone. Burning also was a positive factor in maintaining plant communities, particularly in areas underlain by porous, dissected Ordovician age dolomite. Fire intolerant species such as juniper were noted in the G.L.O. surveys only in "refuge" areas, primarily on the protected east bank hillsides of the Pomme de Terre River where the river served as an effective fire break from fires fanned by prevailing west winds, but are now common throughout the area because burning is tightly regulated. The upshot of all this is that the vegetation mosaic of the G.L.O. survey represents aclimatic parameters conspicuous during parts of the last 3600 years.

We can only anticipate that bedrock, edaphic, topographic settings combining with areal burning similarly constrained vegetation in the earlier Hypsithermal and pre-Hypsithermal. Reduced moisture during the Hypsithermal would have encouraged prairie encroachment into previously forested areas, particularly where bedrock was porous, dissected and had formerly supported a deciduous forest near the edge of the prairie ecotone, as was the case in the lower Pomme de Terre locality. Farther east the Ozark Highland forest was more mesic during the G.L.O. surveys and these areas probably experienced lateral replacement

of mesic forest by more zeric forest with prairie openings during the Hypsithermal.

Subsequent colonization by "dry" but open forest cover seemingly sustained larger herds of deer and other forest edge species in the lower Pomme de Terre drainage, and there was a correlated decline in tall grass prairie. Aquatic faunas seemingly show a similar shift to free flowing streams.

Major post-Hypsithermal landscape changes were fluvial in nature. Terrace-1b experienced local degradation about 2700 B.P. and was abandoned shortly before 800 B.P., when the modern floodplain (T-0) became established. Haynes (1976:58) notes that T-0 is a compound unit of at least two cut-and-fills.

ENVIRONMENTAL IMPACT ON SETTLEMENT

Such radical landscape alteration had natural consequences for settlement that largely are not predictable from models of recent or modern vegetation and topography. The impact these climatic and environmental changes had are more often than not measured over generations if not millennia. To the average Indian who lived here the more dramatic influences on settlement undoubtedly were of a seasonal nature further conditioned by technological and other social developments such as widespread early gardening; as decisive were long term occiliations of the prairie-forest ecotone which resulted in altered subsistence bases and necessitated changes in settlement strategies.

During the early Holocene, Dalton settlement in this locality depended on forested conditions unlike those of later times in valleys whose present-day character was not fully assumed until about one thousand years ago. We can but barely approximate this landscape as to its depth below the modern surface and cannot predict the locations and kinds of Dalton sites that existed. Floodplain valley edge settings were used intermittently for encampments; rivers were free flowing, able to transport large sediment loads, and were a primary source of chert used in chipped stone tools. Upland interfluves were deeply mantled by loess and their use is ill defined.

Subsequent settlement was in a valley undergoing pronounced metamorphosis. By 8100 B.P. the Pomme de Terre River had aggraded some three or four meters and, with at least one interruption about 7500 B.P., continued to aggrade for the next several thousand years. Hillslopes responded to reduced rainfall by becoming unstable and eroded; and instead of being forested now supported tall grass prairie, leading to major differences in potential food resources--with a notable decline in deer. Bedrock outcrops, exposed by accelerated hillslope erosion, replaced the river channels as prime sources of chert, sandstone and dolomite used in chipped or ground stone tool manufacture, a pattern that persists throughout the rest of Pomme de Terre prehistory. Hematite and galena became more readily available and its collection from upland sources was apparently optimal from about 8100 to 6300 B.P., when it was extensively ground into powder at Rodgers Shelter. Probably the year-round visibility of Rodgers Shelter was also enhanced by the presence of nearby upland prairie and a constricted river skirting forest; this, along with its protective overhang, made the site a focal

area for settlement during the Altithermal. Late Hypsithermal abandonment of Rodgers Shelter from 5200 to 3600 B.P. was probably more a product of local deposition of hillslope derived coarse sediment than it was due to a sustained drought. In part, this erosion may have been induced by local intensive use of slopes above the shelter. We can hypothesize further that toe-of-slope areas were unfavorable settlement loci at this time and that center-valley spots not covered by coarse alluvial fans, particularly near artesian springs, became highly favored. The post-Hypsithermal setting witnessed a return to the uplands of forests with reduced prairie openings and generally more favorable habitats for browsers; at Rodgers Shelter and other sites deer hunting again became a prominent subsistence activity. The successful adoption of (probably) small scale gardening about 4300 B.P. cannot be viewed as a response to a specific environment as it was widespread in the Mississippi Valley area. But without doubt crop growing did tend to mute the impact of random failures of mast production as well as leading to more active clearing of bottomland; the latter may have further advanced habitat requirements of many prey species and maintained a fire-tolerant flora too.

Topographic variability in biotic and abiotic resource distributions, as just described, had differential seasonal impacts on settlement as well as being critical predeterminants over time. The affects of seasonal variability for Dalton settlement location are unknown if not unknowable. For later periods, particularly the post-Hypsithermal, our data indicate that only the Pomme de Terre Valley could have sustained annual settlement, the adjacent dissected uplands would have been of primary use from summer through fall and tabular upland prairies would have experienced only intermittent use. During the Hypsithermal, we anticipate that critical resources of water, timber, and many prey species were telescoped into essentially the higher ordered stream valleys, including the Pomme de Terre, and these would have been the most plausible zones of sustained settlement.

CULTURAL VARIABILITY

How well does the cultural record correlate with this environmental model? In synthesizing site usage, seasonality, stylistic and functional differences in artifacts together with more elaboration of the subsistence base, the attempt will be to answer this question and underscore where near information or approaches are needed.

For most of its use, Rodgers Shelter appears to have been a seasonally specialized encampment of a small group or closely aligned groups, probably organized into egalitarian hunter and gatherer bands. During all phases of its prehistory, a fall, possibly going into winter or even early spring use is plausible. There are, however, many differences in the way Rodgers Shelter was used through time and contrasts with other open sites, especially the excavated Pomme de Terre springs.

Dalton

Assuming that storage of food was minimal, Dalton settlement was in short term autumn or spring encampments, perhaps no more than overnight

stays. It is difficult to regard the overhang as having had much significance to Dalton peoples as the early Holocene floodplain was some ten to twelve meters below the shelter at the base of a steeply pitching talus slope; probable Dalton floors were also intersected at depth on the terrace about 100 meters west of the shelter. Individual areas of Dalton activity center around hearths, several of which are superimposed, are adjacent to the talus or were subjected to slope wash during and/or immediately after use; they seemingly were uncovered without a surrounding structure of any recognizable permanence. Where stratification is not apparent, the activity areas do not overlap, at least with respect to mended biface distributions; the argument for larger population aggregates than a single small nuclear family residing at Rodgers Shelter at one time is not supported.

The Dalton subsistence base at Rodgers Shelter manifests a prime reliance on forest, forest edge and riparian mammals. Using tabulated data of Parmalee *et al.* (1976:Tables 9.2, 9.3), minimum number (MNI) of deer killed is eight, or 19.04 per cent of the total MNI of forty-two economically valuable critters; in descending order the other mammals include seven (16.66 per cent) eastern cottontails, five (11.90 per cent) raccoons and squirrels, three (7.14 per cent) plains pocket gophers, two (4.76 per cent) beavers and woodchucks, and one each (2.38 per cent) eastern woodrat, elk, muskrat and coyote. Three turkeys, a single trumpeter swan and a crow constitute avifauna from Dalton floors; box turtle, snake and fish also may have been supplements to the Dalton diet. Regardless of how usable meat is calculated, deer followed by raccoon and beaver stand out as main prey species while squirrels and rabbits were hunted or trapped whenever possible. Game procurement must have utilized sophisticated and efficient stalking and trapping techniques well adapted to woodland and riparian settings by one or a small group of individuals whose basic intent was the targeting of large and medium sized prey. Deer was basic to the economy as both a food item and source of bone, antler and, no doubt, hide or sinew used for tools or clothing. The importance of plant foods is largely unknown but it would be naive to imply that their low profile is more than a fortuitous event brought about by poor preservation.

The Rodgers Dalton tool kit is specialized in four areas: (1) items of the chase are prominently represented by chipped stone points and knives; (2) hide working is inferred from a variety of symmetric and asymmetric chipped stone scrapers, and possibly by graving spurs; (3) wood working, by adzes; and (4) tool maintenance to include fine pressure flaking by antler punches. Further partitioning into activities such as bone slotting or working might also be justified. The care and deliberateness in manufacture of points or adzes go well beyond their functions as projectiles, knives or wood working implements and underscores the importance of these basic extractive activities.

Hypsithermal Usage

Rodgers cultural horizons 8 through 5, or possibly 4, represent periods of Hypsithermal habitation, from roughly 8300 to 5200 B.P. This is of course a long interval coming after a cultural hiatus subsequent to Dalton horizon 10, and is marked by consistency in artifact style and

function as well as a more-or-less regular pattern of site use. The end of this period at 5200 B.P. is arbitrary from the point of view of climatic change but is grounded in the recognition of cultural regularities within this time and major differences in later artifact styles.

For lack of a better term, Rodgers became a base camp of recurrent, sustained habitation over fall, winter and into the spring; it is entirely plausible that the site was visited in the summer as well. Preliminary, indeed tentative, analysis suggests that habitation structures of rude construction were used, and these were in concert with domestic activity centers oriented respective to the shelter drip line. The technological base was greatly expanded over the preceding Dalton and embodied a variety of ground stone tools used in large scale grinding of hematite or vegetal food production; full grooved axes and other heavy wood working implements were prominent as well. Major extractive activities identified by bifacial tool kits include hunting, butchering, wood-bore-antler working and hide preparation; but the vast majority of chipped stone artifacts relate to tool production. Although there are major technologic and spatial contrasts, the scale and kinds of activity are consistent through time.

If subterranean pits were used for storage, these have been obscured by later activity. We have no other evidence of architectural features beyond hearths and a rock cairn dog burial, a unique occurrence; there are isolated pieces of human bone but no burials. Caching of tools, bifacially flaked preforms and other items occurred with some frequency and regularity of pattern in or around the shelter area. It is equally conceivable that food storage was facilitated by means of above ground supports or racks with suspended bags. Regardless, some capacity for food storage is indicated by the debris densities and extent of midden development.

Given the time represented combined with reduced deposition rates, it is plausible that the higher debris densities indicate no more than repeated long term use by a small group or groups rather than an increase in aggregate population size. This would seem to be substantiated by the small numbers of prey species, as calculated in hundred year increments from data presented by Parmalee *et al.* (1976:Tables 9.2, 9.3). The most recurrent species, eastern cottontails and squirrels, respectively occur but 7.30 and 3.95 times per hundred years while raccoons and deer were taken with even less frequency (respectively, 2.05 and 2.00); on a hundred year basis bison are virtually nonexistent (0.35) as are pronghorn (0.10).

The annual subsistence round was geared toward small game, birds, fish, mussels; extensive use of plants is implied by the ground stone industry. Prairie species occur but most are either riparian or are found in the river skirting forest or forest edge settings. Deer were undoubtedly still a main staple while bison were taken only in horizons 7 and 8, and were largely unimportant. There was, relative to other species, a decline in deer hunting that McMillan (1976:228) infers came about because of extended drought, a position which finds support in this study. In sum, the subsistence economy was one of diffuse hunting and gathering. The major contrast with Dalton in emphasis of small game over deer, probably accompanied by more intensive use of plant resources,

appears to be a more-or-less direct response to changing environmental conditions rather than a decline in hunting efficiency. Diachronic shifts in relative reliance on rabbits and other small rodents and away from squirrels (McMillan 1976:224-225) are not substantiated by the reanalysis of stratigraphic contacts.

Beyond the altered subsistence base, prime contrasts with the preceding Dalton are: (1) a greatly expanded and diversified technological base; (2) evidence of sustained settlement over major portions of the year; (3) use of Rodgers as an industrial processing center for pigment preparation; (4) domestication of the dog; and (5) a proliferation of artifact styles.

The Late Hypsithermal Transition

At Rodgers the final phase of Hypsithermal occupation is about 5200 B.P., best expressed on the west terrace where an extensive component has been identified in backhoe trenches. Essentially contemporaneous use of the shelter is indicated by Stratum 3 hearths and mussel shell concentrations. In neither area, however, has sampling proceeded to a sufficient degree to resolve questions of community layout or whether or not the same range of activities occur as previously in the shelter area. One might expect the latter to be the case as site use appears to have been simply displaced once the shelter area filled with coarse sediments after 6300 B.P. Should there be an opportunity for future work, a block excavation of this west terrace component is recommended to resolve these questions, to further expand the coverage of environmentally sensitive fauna, and to collect data for comparison with subsequent valley occupation beginning about 4300 B.P.

Settlement after 4300 B.P. until 2600 B.P. and probably later was by a population adopting new stylistic attributes, a varied technologic base, and an economy geared increasingly to forest edge environs and small scale gardening. Interestingly enough, there are few if any exotic items other than squash and gourd that would indicate an exterior trade network. And the presence of cucurbits in the lower Pomme de Terre valley is perhaps all the more remarkable in the absence of high status or scare trade items. This region was peripheral to all but the most tangible products of interregional contact.

Our picture of lower Pomme de Terre settlement during this transitional period is far from complete but is one of more-or-less annual base camps, small villages and seasonal encampments. Insight into their identification, duration, contemporaneity, morphology, subsistence base, population size and structure have come from shelter and spring sites excavation, especially of Rodgers and Phillips, but much remains to be learned.

Using Phillips as a model, base areas were typically near artesian springs or were open sites near a perennial water source. Domestic use or residential areas are identified by large lithic scatters having hearths, a variety of chipped stone tools, possibly one or two stationary grinding slabs, or metates, bits of calcined animal bone, charred and uncharred seeds and nuts. At Phillips these features are oriented to cardinal directions and are well away from the spring conduit; wall posts have not been recognized but I assume that these were enclosed or

covered. Along with chipped stone points, adzes are common; these, together with prepared posts and other evidence of heavy wood working attest to the significance of timber resource utilization at base areas. Food production through cultivation of squash and gourd, gathering of wild plant foods and a capacity for food storage as seen in the subterranean pits provided a measure of residential stability that previously may not have existed.

Pit excavation at Phillips and other Pomme de Terre spring sites poses a problem in as much as the storage pits are near the spring conduit and their excavation and use would have required reduced or arrested spring discharge. Indeed many of Phillips pits are stratified into an initial phase of use (fall-spring) as a storage chamber and subsequent filling during periods of increased spring discharge or overbank flooding. Dated pit matrix samples indicate that not all are contemporaneous but rather span about 1650 years, with two adjacent pits expressing the maximum range from about 3650 to 2000 years B.P. Thus several periods of reduced discharge are represented and some may be coincident with stages of reduced discharge at other springs (King 1973; Bass and McMillan 1973; King and McMillan 1975). Regarding these data as regional phenomena may well be in order but the reasons for discharge reduction are far from simple.

One possibility is that artesian springs express regional hydrology in microcosm (King and Allen 1977). Changes of regional precipitation and seasonal differences in drainage are noted for many Ozark highland springs. The presence of pits or other evidence of aboriginal use might indicate times of drought. During such times food storage may have assumed even greater importance; artesian springs even with reduced flow would have been valuable sources of water and a natural focus for settlement.

An alternative is that regional climate has little to do with spring discharge. The 1961 Alaskan earthquake, for instance, was followed by peculiar changes in spring discharge and well levels across the Missouri Ozarks. Ozark wells in no predictable fashion either gained, lost water or went completely dry (Allen 1975, pers comm). An artesian spring about a mile west of Phillips, Trolinger, ceased flowing. As far as recent memory is concerned, Phillips has always been a reliable source of water, even after the Alaskan earthquake or during the dustbowls of the 1930's. The water from Phillips and other Pomme de Terre springs is probably from very deep and old aquifers (Phillips water has a C^{14} date of about 8300 years B.P. from CO_2, which may indicate a predominately old component to the discharge). The relationship of surficial runoff to spring discharge in this drainage at least is very much an open question. As a problem for future study, the reduced discharge of some Pomme de Terre springs (Table 17.1) promises to be a prime focus of paleoenvironmental and cultural reconstructions.

The configuration of Phillips architectural features from the 1977 excavation suggests a dichotomous usage of spring areas as food storage and at greater distances from the spring dwelling or residential zones. But radiocarbon dating indicates that this layout is more apparent than real: There is no necessary correlation between excavated, dated storage pits and residential features though other unexcavated pits might well

TABLE 17.1

Periods of Reduced Spring Discharge

Periods B.P.*	Phillips	Boney
1900-2000	X	X
2300	X	
3640	X	
3840	X	
3925-4000	X	
4300-4240	X	

*uncorrected Libby halflife

be contemporaneous. The intrasite morphology of Phillips is thus difficult to approximate for even one of its many components; still the spring - terrace setting does appear to impose limitations to the use of space. One possibility is that storage pits were easier to conceal in the thicket-like brush near the spring. Second, the spring area being wetter may have been easier to dig, or may have kept wild and cultivated plant foods in better condition.

With respect to Phillips group size and structure, there is little that can be said beyond what is purely conjecture. Even acknowledging problems of intrasite correlation, individual components at Phillips are very discrete and, relative to Rodgers Shelter, have little midden development outside of residential areas. At any one time Phillips group sizes appear to have been small, again no more than a few nuclear families or a small band. Later in this period, from 3600 to 2600 B.P., Phillips occupation was contemporaneous with that of lower Pomme de Terre cave and shelter sites. Whether these various occupations were by the same or closely aligned but geographically segmented people is not known.

What is clear is that contemporaneous usage of protected cave or shelter settings was seasonally specialized with contrasts in site technology and activity. Fall seasonal habitation at Rodgers Shelter had no comparable emphasis on a wood working technology and the most striking inferred activity is specialized cutting or butchering of game. Identified domestic areas are small and without orientation to the overhang. Neither horticulture nor food storage (in subterranean pits) had much impact on the Rodgers subsistence economy, which emphasized game hunting, fishing, mussel and plant food (nuts particularly) collecting.

Human burials attributable to this period are known only from Rodgers Shelter though, in light of their flexed positions and difficulties in intrasite dating exemplified by Phillips, individual burials from several spring sites (Bass and McMillan 1973; Wood 1976:105; Saunders 1978) might be considered too. The Rodgers burials consist of three individuals, at least two were in ill health (Bass and Rhule 1976); two were placed into separate burial pits; all were flexed and in close proximity below the western end of the overhang where it joins the

bluff. Burial furniture accompanied two of the burials, including possibly an engraved limestone plaque (Ahler and McMillan 1976:Fig. 10.15) though this is not certain. Interment may not have been within the same year. There is really no way of knowing. But they do illustrate use of a single peripheral shelter area for burial purposes after 3600 B.P. It is not known if these burials represent anything more than normal mortality at Rodgers or if the interment methods are restricted solely to this time.

The Final Ceramic Occupations

When the preceramic ends and ceramics began are unclear. As a rude guess, 2500 B.P., the start of horizon 2 at Rodgers Shelter, is plausible; certainly by 1900 B.P. a developed ceramic technology existed. A correlated but later innovation of major impact was the introduction of the bow and arrow about 1200 B.P.

These two events, initial introduction of pottery and subsequently the bow and arrow, demark two major phases in lower Pomme de Terre settlement that essentially complete the prehistoric chronicle. The first phase includes a continuation of basic subsistence and settlement patterns. Indeed the continuity in storage pit contents from 3600 to 1900 B.P. is remarkable and pottery does not signal any major change in subsistence pattern. Similar trends are seen in use of shelter and (probably) open spring settings: Major activity indicators for Rodgers are food grinding and hunting during the fall. If the increase in size and number of domestic areas is indicative of a population increase, then the group size(s) at Rodgers are larger. A possible contrast with the immediately preceding period was that the resident population re-adapted stylistic elements of neighboring Hopewell communities into their own ceramics and, by extension, exterior contacts had minimal but important ramifications for community life.

The final phase differs primarily in an almost exclusive emphasis on hunting at Rodgers Shelter. This involved indigenous Late Woodland groups as well as itinerant Mississippian hunting parties from villages along the southern Prairie Peninsula border.

TAXONOMY AND TRADITION

A cohesive taxonomic system for the western Ozark Highland will have to await collection of other data from other localities in and near the Ozark subarea. Nonetheless, for the lower Pomme de Terre we do have sufficient information to recognize, albeit in preliminary terms, adaptive and stylistic trends that define regional traditions of the Holocene. In sequential order these are Dalton; two Archaic traditions, Hypsithermal Hunting and Gathering, and Transitional Horticulture; an Ozark Highland Middle Woodland; and a final mixed Late Woodland/Mississippian tradition. With the possible exception of the last, these traditions are presumed to have developed by viable, indigenous Ozark Highland communities that display to varying degrees the affects of interregional contact. As such the Ozark Highland is not viewed as having experienced cultural lag during the Archaic or Woodland. Indeed, the Dalton and subsequent Archaic communities would seem to have been in

the forefront of eastern North American technological and subsistence adaptations. The Ozark subarea, however, is not noted as a Hopewellian center and the Pomme de Terre data indicate that resident populations retained their own identity while becoming involved with Hopewellian villages to the north and west; to what degree or extent is unknown. Final prehistoric use of this region was by both an indigenous Late Woodland population and probably coeval transient hunting parties from Mississippian villages.

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APPENDIX I

MITIGATION OF THE ADVERSE EFFECT OF HARRY S. TRUMAN DAM AND RESERVOIR PROJECT, MISSOURI, ON RODGERS SHELTER ARCHEOLOGICAL SITE

SCOPE OF WORK

1. Introduction

The Government is currently engaged in the construction of the Harry S. Truman Dam and Reservoir project on the Osage River, Missouri. The dam will create a reservoir of approximately 55,600 acres. It is proposed that approximately 166,000 acres be purchased in fee.

One of the effects of this project is inundation of Rodgers Shelter, an archeological site located in the Pomme de Terre arm of the reservoir. This site is listed on the National Register of Historic Places. A Memorandum of Agreement was drawn up in 1973 and was signed by Colonel William R. Needham, District Engineer, KCD, along with representatives from the offices of the State Historic Preservation Officer and the Advisory Council on Historic Preservation.

The work defined herein to be performed by the Contractor will be in accordance with the action called for in the Memorandum of Agreement. In essence, the work will be to recover and analyze materials contained in the archeological site prior to its inundation by the multipurpose pool of the reservoir. This work will provide documentation evidencing compliance with Executive Order 11593, "Protection and Enhancement of the Cultural Environment," dated 13 May 1971. Funding for this type of work is authorized under Public Law 86-523 as amended by Public Law 93-291.

2. Scope

This work encompasses the removal and subsequent analysis of data contained in Rodgers Shelter Archeological Site sufficient to meet the requirements of the previously mentioned Memorandum of Agreement. This site is located on a right bank terrace of the Pomme de Terre River (N1/2, Sec. 33, T. 39 N., R. 22 W.). The site is approximately 4 acres in size, dimensions being about 900 feet x 250 feet.

The Contractor will conduct the excavation and interpretation in a professional manner. The Contractor will recover and prepare the materials for analysis and evntual storage. Subsequent to the analysis of the data, the Contractor will prepare a report of findings in accordance with the format described in Section 5.

3. Study Approach.

The work to be performed by the Contractor will be coordinated with all other contractors doing cultural resource work at this project. Periodically the Contractor and his representatives along with representatives of the other contractors will meet with the Corps of Engineers. The National Park Service will be invited by the Corps to send an observer to provide comments and advice to the Corps. These meetings will be conducted every 3 months to review the work of this Contractor, to provide guidance to the Contracting Officer or his representative concerning the planned work for the next 3 months, to provide written summarization of the work accomplished thus far, and provide coordination among contractors for the benefit of all parties.

The Contractor will utilize the following methods to complete the study.

(1) The Contractor will analyze all reports prepared since 1964 discussing any of the studied materials previously recorded from the site. In addition, the Contractor will analyze all such materials not studied prior to this contract, making every effort not to duplicate earlier owrk.

(2) The Contractor will perform preliminary test excavations to determine locations for the final excavation and subsequent removal of materials. All materials will be properly treated in the field to eliminate any damage. Containers housing the materials will be clearly marked as property of the U.S. Government. All field excavation will be completed prior to 31 December 1977.

(3) After the removal of materials, the Contractor will perform the laboratory analyses and subsequent interpretation of the data. Analysis will be made of all materials.

(4) Special emphasis will be placed upon the following:

Identification and analysis of associated faunal and floral materials.

Identification and analysis of cultural materials.

Utilization of radiometric dating methods.

Utilization of data processing to speed the classification of materials from the site.

Analysis of the pedological and geological character of the area.

(5) The Contractor will provide a safe working environment for all persons in his employ as prescribed by EM 385-1-1, "General Safety Requirements."

4. Availability of Data

It is intended that the Contractor shall conduct all necessary review of literature, governmental reports, and other sources of information in the depth required for a comprehensive coverage of the study. The Contractor is expected to accumulate, develop, and interpret all needed scientific and technological information and data.

The Government will provide the Contractor with available background maps, information from remotely sensed data (if any), files, reports, and correspondence, as needed. Other contractors working near the site will be required to coordinate their work with the excavation at Rodgers Shelter.

5. Schedule of Work

The Contractor is expected to pursue the study in a timely, workmanlike manner to meet the target dates set out below. In addition, it is expected that the Contractor and those in his employ, may during the term of the contract, present reports of the work at Rodgers Shelter to various professional societies and publications. Outlines of those reports dealing with the work sponsored by the Corps of Engineers will be sent to the Kansas City District Office for review prior to presentation or publication. Proper credit will be given for the Corps sponsored work, and the Corps will be furnished six (6) copies of each such paper and/or published report. During the course of the study, the Contractor will submit a monthly progress report.

An original and 12 copies of a draft of a report of findings, together with copies of background data, shall be submitted to the Government for purposes of peer and governmental review within 30 months after receiving the notice to proceed with work. (If excessive inclement weather or other delays are incurred, this date may be extended to one mutually agreed upon between the Government and the Contractor.)

Ninety (90) days after the return of the draft report from the Government or within 36 months after receiving the notice to proceed, the Contractor will submit an original and three (3) copies of a final report of findings. This report will contain the following:

Photographs of representative materials uncovered.

Detailed drawings showing the extent of the excavation, test pits, and the location of any previously excavated areas.

Detailed drawings showing the types and relative density of materials found.

A discussion of each cultural component in the site.

A discussion of how each cultural component related to its environment.

A discussion of the faunal materials located in the site and how they relate to the different cultural components.

A discussion of the floral materials located in the site and how they relate to the different cultural components.

The final report shall be furnished in either one and one-half spaced or double spaced typing either on one side of a page only or on both sides of a page at the option of the Contractor. The size of pages shall be eight inches by ten and one-half inches except for fold-out maps, charts, or other illustrative material. Drawings, photographs, and text shall be of a quality suitable for reproduction.

Attached to the letter of transmittal for the final report will be a listing of all materials found during the field investigations and a Certificate of Authenticity for the material. (These materials are to be stored in containers clearly marked "Property of the U.S. Government, Army Corps of Engineers, KCD." These materials are to be stored at the contracting firm's laboratories for use in future studies. However, the Government reserves the right of retrieval of these materials. If the materials are to be removed from the laboratories, this action must be approved by the Kansas City District Office.) Curatorial costs are to be included in the estimated budget.

Melvin A. Johnson

MELVIN A. JOHNSON
Geographer

ILLINOIS STATE MUSEUM SOCIETY

Milton D. Thompson

Executive Secretary

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